



***Analyzer
Repair Inc.***

Test Equipment Repair & Calibration

HP 8590 Series

HP 8590L Calibration Guide

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Hewlett-Packard
H-P 8590L

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Calibrating

This chapter contains performance test procedures which test the electrical performance of the spectrum analyzer.

Allow the spectrum analyzer to warm up in accordance with the Temperature Stability specification in Chapter 2 before performing the tests in this chapter.

None of the test procedures involve removing the cover of the spectrum analyzer.

Calibration

Calibration verifies that the spectrum analyzer performance is within all specifications listed in Chapter 2. It is time consuming and requires extensive test equipment. Calibration consists of *all* the performance tests. See Table 1-1 for a complete listing of the performance tests.

Operation Verification

Operation verification consists of a subset of the performance tests. See Table 1-1. Operation verification tests only the most critical specifications of the spectrum analyzer. These tests are recommended for incoming inspection, troubleshooting, or after repair. Operation verification requires less time and equipment than the calibration.

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The following table lists the performance tests included in this chapter. Select the spectrum analyzer option being calibrated and perform the tests marked in the option column. Note that some of the tests are used for both calibration and operation verification (marked with ).

Table 1-1. Performance Verification Tests

Performance Test Name	Calibration for Instrument Option:				
	Std ¹	001	010	011	713
1. 10 MHz Reference Output Accuracy					
2. Frequency Readout and Marker Count Accuracy					
3. Frequency Readout Accuracy (Option 713)					
4. Noise Sidebands					
5. System Related Sidebands	.	.	.	.	.
6. Frequency Span Readout Accuracy	.	.	.	.	.
7. Sweep Time Accuracy	.	.	.	.	.
8. Scale Fidelity					
9. Reference Level Accuracy					
10. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties					
11. Calibrator Amplitude and Frequency Accuracy					
12. Frequency Response					
13. Other Input Related Spurious Responses	.	.	.	.	.
14. Spurious Response ²					
15. Gain Compression	.	.	.	.	.
16. Displayed Average Noise Level					
17. Residual Responses	.	.	.	.	.
18. Absolute Amplitude, Vernier, and Power Sweep Accuracy			.	.	
19. Tracking Generator Level Flatness			.	.	
20. Harmonic Spurious Outputs			.	.	
21. Non-Harmonic Spurious Outputs			.	.	
22. Tracking Generator Feedthrough			.	.	

¹ Use this column for all other options *not* listed in this table.

² "Part 2: Third Order Intermodulation Distortion, 50 MHz" is not required for operation verification.

Safety

Familiarize yourself with the safety symbols marked on the pulse generator, and read the general safety instructions and the symbol definitions given in the front of this manual *before* you begin verifying performance of the pulse generator.

Before You Start

There are four things you should do before starting a performance verification test:

- Switch the spectrum analyzer on and let it warm up in accordance with the Temperature Stability specification in Chapter 2.
- Read "Making a Measurement" in Chapter 2 of the *HP 8590 E-Series and L-Series Spectrum Analyzer User's Guide*.
- After the spectrum analyzer has warmed up as specified, perform the Self-Calibration Procedure documented in "Improving Accuracy With Self-Calibration Routines" in Chapter 2 of the *HP 8590 E-Series and L-Series Spectrum Analyzer User's Guide*. The performance of the spectrum analyzer is only specified after the spectrum analyzer calibration routines have been run and if the spectrum analyzer is autocoupled.
- Read the rest of this section before you start any of the tests, and make a copy of the Performance Test Record described in "Recording the Test Results."

Test equipment you will need

Tables 1-2 through 1-4 lists the recommended test equipment for the performance tests. The tables also lists recommended equipment for the spectrum analyzer adjustment procedures which are located in the *HP 8590 E-Series and L-Series Spectrum Analyzer, and HP 8591C Cable TV Analyzer Assembly-Level Repair Service Guide*. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model.

Recording the test results

A performance test record is provided at the end of this chapter.

Each test result is identified as a *TR Entry* in the performance tests and on the performance test record. We recommend that you make a copy of the performance test record, record the test results on the copy, and keep the copy for your calibration test record. This record could prove valuable in tracking gradual changes in test results over long periods of time.

If the spectrum analyzer doesn't meet specifications

If the spectrum analyzer fails a test, rerun the frequency calibration and amplitude calibration routines by pressing **CAL FREQ & AMPTD**. Press **CAL STORE**, then repeat the verification test. If the spectrum analyzer still fails one or more specifications, complete any remaining tests and record all test results on a copy of the test record. Then refer to Chapter 3, "If You Have a Problem," for instructions on how to solve the problem.

Periodically verifying operation

The spectrum analyzer requires periodic verification of operation. Under most conditions of use, you should test the spectrum analyzer at least once a year with either operation verification or the complete set of performance verification tests.

Table 1-2. Recommended Test Equipment

Equipment	Critical Specifications for Equipment Substitution	Recommended Model	Use ¹
Digital Voltmeter	Input Resistance: ≥ 10 megohms Accuracy: ± 10 mV on 100 V range	HP 3456A	P,A,T
DVM Test Leads	For use with HP 3456A	HP 34118	A,T
Frequency Standard	Frequency: 10 MHz Timebase Accy (Aging): $< 1 \times 10^{-9}$ /day	HP 5061B	P,A
Measuring Receiver	Compatible with Power Sensors dB Relative Mode Resolution: 0.01 dB Reference Accuracy: $\pm 1.2\%$	HP 8902A	P,A,T
Microwave Frequency Counter	Frequency Range: 9 MHz to 7 GHz Timebase Accy (Aging): $< 5 \times 10^{-10}$ /day	HP 5343A	P,A,T
Oscilloscope	Bandwidth: dc to 100 MHz Vertical Scale Factor of 5 V/Div	HP 54501A	T
Power Meter	Power Range: Calibrated in dBm and dB relative to reference power -70 dBm to +44 dBm, sensor dependent	HP 436A	P,A,T
Power Sensor	Frequency Range: 100 kHz to 1800 MHz Maximum SWR: 1.60 (100 kHz to 300 kHz) 1.20 (300 kHz to 1 MHz) 1.1 (1 MHz to 2.0 GHz) 1.30 (2.0 to 2.9 GHz)	HP 8482A	P,A,T
Power Sensor ²	Frequency Range: 1 MHz to 2 GHz Maximum SWR: 1.18 (600 kHz to 2.0 GHz) 75 Ω	HP 8483A	P,A,T
Power Sensor, Low-Power	Frequency Range: 300 MHz Amplitude Range: -20 dBm to -70 dBm Maximum SWR: 1.1 (300 MHz)	HP 8484A	P,A,T

1 P = Performance Test, A = Adjustment, T = Troubleshooting

2 Option 001 and Option 011 Only

Table 1-2. Recommended Test Equipment (continued)

Equipment	Critical Specifications for Equipment Substitution	Recommended Model	Use ¹
Signal Generator	Frequency Range: 1 MHz to 1000 MHz Amplitude Range: -35 to -16 dBm SSB Noise: < -120 dBc/Hz at 20 kHz offset	HP 8640B, Option 002	P,A,T
Spectrum Analyzer, Microwave	Frequency Range: 100 kHz to 7 GHz Relative Amplitude Accuracy: 100 kHz to 1.8 GHz: < ±1.8 dB Frequency Accuracy: < ±10 kHz @ 7 GHz	HP 8566A/B	P,A,T
Synthesized Sweeper	Frequency Range: 10 MHz to 1.8 GHz Frequency Accuracy (CW): ± 0.02% Leveling Modes: Internal and External Modulation Modes: AM Power Level Range: -35 to -16 dBm	HP 8340A/B	P,A,T
Synthesizer/Function Generator	Frequency Range: 0.1 Hz to 500 Hz Frequency Accuracy: ±0.02% Waveform: Triangle	HP 3325B	P,T
Synthesizer/Level Generator	Frequency Range: 1 kHz to 80 MHz Amplitude Range: +12 to -85 dBm Flatness: ±0.15 dB Attenuator Accuracy: ±0.09 dB	HP 3335A	P,A,T

¹ P = Performance Test, A = Adjustment, T = Troubleshooting

Table 1-3. Recommended Accessories

Equipment	Critical Specifications for Accessory Substitution	Recommended Model	Use ¹
Active Probe	5 Hz to 500 MHz 300 kHz to 3 GHz	HP 41800A HP 85024A	T
Adapter	APC 3.5 (f) to APC 3.5 (f)	5061-5311	P,A,T
Adapter	BNC (f) to dual banana plug	1251-1277	P,A,T
Adapter	BNC (m) to BNC (m)	1250-0216	P,A,T
Adapter ²	BNC (m) to BNC (m), 75 Ω	1250-1288	P,A,T
Adapter	BNC (f) to SMB (m)	1250-1237	A,T
Adapter	BNC tee (m) (f) (f)	1250-0781	T
Adapter	Type N (f) to APC 3.5 (f)	1250-1745	P,A,T
Adapter	Type N (f) to APC 3.5 (m)	1250-1750	P,A,T
Adapter	Type N (m) to APC 3.5 (m)	1250-1743	P,A,T
Adapter	Type N (f) to BNC (f)	1250-1474	P,A,T
Adapter	Type N (f) to BNC (m)	1250-1477	P,A,T
Adapter ²	Type N (f) to BNC (m), 75 Ω	1250-1534	P,A,T
Adapter	Type N (m) to BNC (f) (4 required)	1250-1476	P,A,T
Adapter	Type N (m) to BNC (m) (2 required)	1250-1473	P,A,T
Adapter	Type N (f) to N (f)	1250-1472	P,A,T
Adapter	Type N (m) to N (m)	1250-1475	P,A,T
Adapter	Type N (f) to N (f), 75 Ω	1250-1529	P,A,T
Adapter ²	Type N (f), 75 Ω , to Type N (m), 50 Ω	1250-0597	P,A,T
Adapter	SMB (f) to SMB (f)	1250-0682	A,T
Adapter	SMB (m) to SMB (m)	1250-0813	A,T
Adapter, ² Minimum Loss	50 to 75 Ω , matching Frequency Range: dc to 2 GHz Insertion Loss: 5.7 dB	HP 11852B	P,A,T

1 P = Performance Test, A = Adjustment, T = Troubleshooting

2 Option 001 and Option 011 Only

Table 1-3. Recommended Accessories (continued)

Equipment	Critical Specifications for Accessory Substitution	Recommended Model	Use ¹
Attenuator, 10 dB	Type N (m to f) Frequency: 300 MHz	HP 8491A Option 010	P,A,T
Attenuator, 1 dB Step	Attenuation Range: 0 to 12 dB Frequency Range: 50 MHz Connectors: BNC female	HP 355C	P,A
Attenuator, 10 dB Step	Attenuation Range: 0 to 30 dB Frequency Range: 50 MHz Connectors: BNC female	HP 355D	P,A
Digital Current Tracer	Sensitivity: 1 mA to 500 mA Frequency Response: Pulse trains to 10 MHz Minimum Pulse Width: 50 ns Pulse Rise Time: <200 ns	HP 547A	T
Directional Bridge	Frequency Range: 0.1 to 110 MHz Directivity: >40 dB Maximum VSWR: 1.1:1 Transmission Arm Loss: 6 dB (nominal) Coupling Arm Loss: 6 dB (nominal)	HP 8721A	P,T
Logic Pulser	TTL voltage and current drive levels	HP 546A	T
Logic Clip	TTL voltage and current drive levels	HP 548A	T
Low-Pass Filter, 50 MHz	Cutoff Frequency: 50 MHz Rejection at 80 MHz: >50 dB	0955-0306	P,T
Low-Pass Filter, 300 MHz	Cutoff Frequency: 300 MHz Bandpass Insertion Loss: <0.9 dB at 300 MHz Stopband Insertion Loss: >40 dB at 435 MHz	0955-0455	P,A,T
Power Splitter	Frequency Range: 50 kHz to 1.8 GHz Insertion Loss: 6 dB (nominal) Output Tracking: <0.25 dB Equivalent Output SWR: <1.22:1	HP 11667A	P,A
Termination, 50 Ω	Impedance: 50 Ω (nominal) (2 required for Option 010)	HP 908A	P,T
Termination, 75 Ω ²	Impedance: 75 Ω (nominal) (2 required for option 011)	HP 909E Option 201	P,T

1 P = Performance Test, A = Adjustment, T = Troubleshooting

2 Option 001 and Option 011 Only

Table 1-4. Recommended Cables

Equipment	Critical Specifications for Cable Substitution	Recommended Model	Use ¹
Cable	Type N, 183 cm (72 in)	HP 11500A	P,A,T
Cable	Frequency Range: dc to 1 GHz Length: ≥ 91 cm (36 in) Connectors: BNC (m) both ends (4 required)	HP 10503A	P,A,T
Cable	Frequency Range: dc to 310 MHz Length: 20 cm (9 in) Connectors: BNC (m) both ends	HP 10502A	P,A,T
Cable ²	BNC, 75 Ω , 30 cm (12 in)	5062-6452	P,A,T
Cable ²	BNC, 75 Ω , 120 cm (48 in)	15525-80010	P,A,T
Cable, Test	Length: ≥ 91 cm (36 in) Connectors: SMB (f) to BNC (m) (2 required)	85680-60093	A,T

¹ P = Performance Test, A = Adjustment, T = Troubleshooting

² Option 001 and Option 011 Only

1. 10 MHz Reference Output Accuracy

1. 10 MHz Reference Output Accuracy

The settability is measured by changing the setting of the digital-to-analog converter (DAC) which controls the frequency of the timebase. The frequency difference per DAC step is calculated and compared to the specification.

The related adjustment for this performance test is the "10 MHz Frequency Reference Adjustment."

Equipment Required

Frequency counter
Frequency standard
Cable, BNC, 122 cm (48 in) (2 required)

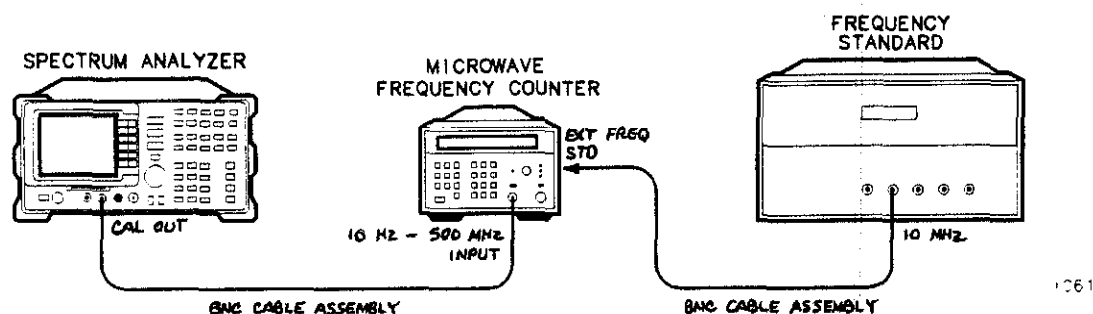


Figure 1-1. 10 MHz Reference Test Setup

Procedure

The test results will be invalid if REF UNLK is displayed at any time during this test. REF UNLK will be displayed if the internal reference oscillator is unlocked to the 10 MHz reference. A REF UNLK might occur if there is a hardware failure or if the jumper between 10 MHz REF OUTPUT and EXT REF IN on the rear panel is removed.

1. Connect the equipment as shown in Figure 1-1.
2. Set the frequency counter controls as follows:

SAMPLE RATE	Midrange
50 Ω /1 M Ω SWITCH	50 Ω
10 Hz-500 MHz/500 MHz-26.5 GHz SWITCH	10 Hz-500 MHz
FREQUENCY STANDARD (Rear panel)	EXTERNAL

3. Wait for the frequency counter reading to stabilize. Record the frequency counter reading in the 10 MHz Reference Accuracy Worksheet as Counter Reading 1.
4. Set the spectrum analyzer by pressing the following keys:

FREQUENCY -37 **Hz**
CAL More 1 of 4 More 2 of 4
VERIFY TIMEBASE

5. Record the number in the active function block of the spectrum analyzer in the 10 MHz Reference Accuracy Worksheet as the Timebase DAC Setting.

1. 10 MHz Reference Output Accuracy

6. Add one to the Timebase DAC Setting recorded in step 5, then enter this number using the DATA keys on the spectrum analyzer. For example, if the timebase DAC setting is 105, press 1,0,6 (Hz).
7. Wait for the frequency counter reading to stabilize. Record the frequency counter reading in the 10 MHz Reference Accuracy Worksheet as Counter Reading 2.
8. Subtract one from the Timebase DAC Setting recorded in step 5, then enter this number using the DATA keys on the spectrum analyzer. For example, if the timebase DAC setting is 105, press 1, 0, 4, (Hz).
9. Wait for the frequency counter reading to stabilize. Record the frequency counter reading in the 10 MHz Reference Accuracy Worksheet as Counter Reading 3.

10 MHz Reference Accuracy Worksheet

Description	Measurement
Counter Reading 1	_____ Hz
Timebase DAC Setting	_____
Counter Reading 2	_____ Hz
Counter Reading 3	_____ Hz

10. Calculate the frequency settability by performing the following steps:
 - Calculate the frequency difference between Counter Reading 2 and Counter Reading 1.
 - Calculate the frequency difference between Counter Reading 3 and Counter Reading 1.
 - Divide the difference with the greatest absolute value by two and record the value as TR Entry 1 of the performance test record. The settability should be less than ± 150 Hz.
 - Press (PRESET) on the spectrum analyzer. The timebase DAC will be reset automatically to the value recorded in step 5.

2. Frequency Readout and Marker Count Accuracy

2. Frequency Readout and Marker Count Accuracy

The frequency readout accuracy of the spectrum analyzer is tested with an input signal of known frequency. By using the same frequency standard for the spectrum analyzer and the synthesized sweeper, the frequency reference error is eliminated.

The related adjustment for this performance test is the "Sampler Match Adjustment."

If the spectrum analyzer is equipped with Option 713, Delete Counterlock, perform the performance test "Frequency Readout Accuracy" instead.

Equipment Required

- Synthesized sweeper
- Adapter, Type N (f) to APC 3.5 (m)
- Adapter, APC 3.5 (f) to APC 3.5 (f)
- Cable, Type N, 183 cm (72 in)
- Cable, BNC, 122 cm (48 in)

Additional Equipment for Option 001

- Adapter, minimum loss
- Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

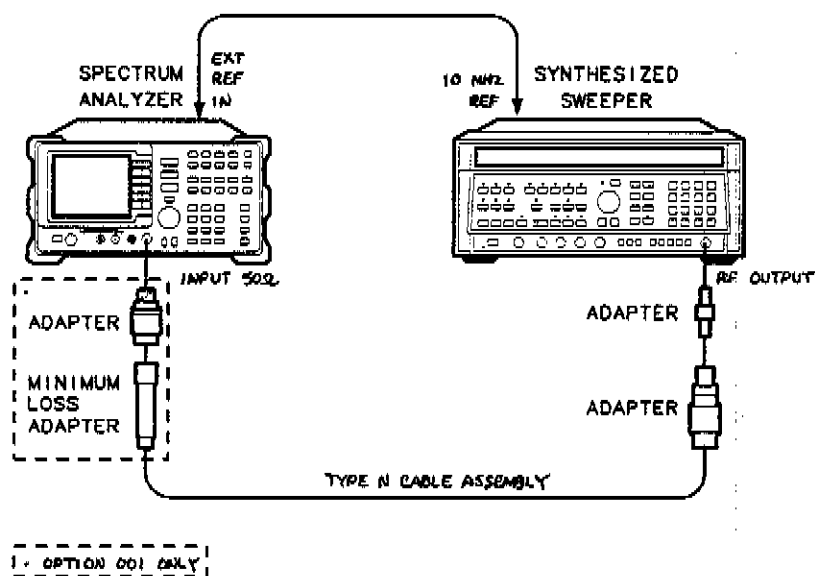


Figure 1-2. Frequency Readout Accuracy Test Setup

2. Frequency Readout and Marker Count Accuracy

Procedure

This performance test consists of two parts:

- Part 1: Frequency Readout Accuracy
- Part 2: Marker Count Accuracy

Perform "Part 1: Frequency Readout Accuracy" before "Part 2: Marker Count Accuracy."

Part 1: Frequency Readout Accuracy

1. Connect the equipment as shown in Figure 1-2. Remember to connect the 10 MHz REF OUT of the synthesized sweeper to the EXT REF IN of the spectrum analyzer.
2. Perform the following steps to set up the equipment:
 - Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:
CW 1.5 GHz
POWER LEVEL -10 dBm
 - Press **PRESET** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:
FREQUENCY 1.5 **GHz**
SPAN 20 **MHz**
 - Press **PEAK SEARCH** on the spectrum analyzer to measure the frequency readout accuracy.
 - Record the MKR frequency reading in the performance test record. The reading should be within the limits shown in Table 1-5.
 - Change to the next spectrum analyzer span setting listed in Table 1-6.
 - Repeat steps 3 through 5 for each spectrum analyzer span setting listed in Table 1-6.

Table 1-5. Frequency Readout Accuracy

Spectrum Analyzer Span (MHz)	MKR Reading		
	Min. (MHz)	TR Entry (Actual)	Max. (MHz)
20	1.49918	1	1.50082
10	1.49958	2	1.50042
1	1.499968	3	1.500032

2. Frequency Readout and Marker Count Accuracy

Part 2: Marker Count Accuracy

Perform "Part 1: Frequency Readout Accuracy" before performing this procedure.

1. Press **[PRESET]** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer to measure the marker count accuracy by pressing the following keys:

[FREQUENCY] 1.5 **[GHz]**

[SPAN] 20 **[MHz]**

[BW] RES BW AUTO MAN 300 **[kHz]**

[MKR FCTN] MK COUNT ON OFF (ON)

More 1 of 2

CNT RES AUTO MAN 100 **[Hz]**

2. Press **[PEAK SEARCH]**, then wait for a count be taken (it may take several seconds).
3. Record the CNTR frequency reading as TR Entry 5 of the performance test record. The reading should be within the limits of 1.4999989 GHz and 1.5000011 GHz.
4. Change the spectrum analyzer settings by pressing the following keys:

[SPAN] 1 **[MHz]**

[MKR FCTN] MK COUNT ON OFF (ON)

More 1 of 2

CNT RES AUTO MAN 10 **[Hz]**

5. Press **[PEAK SEARCH]**, then wait for a count be taken (it may take several seconds).
6. Record the CNTR frequency reading as TR Entry 6 of the performance test record. The reading should be within the limits of 1.4999989 GHz and 1.5000011 GHz.

3. Frequency Readout Accuracy for Option 713

The frequency readout accuracy of the spectrum analyzer is tested with an input signal of known frequency.

There are no related adjustment procedures for this performance test.

If the spectrum analyzer is *not* equipped with Option 713, Delete Counterlock, perform the performance test "Frequency Readout and Marker Count Accuracy" instead.

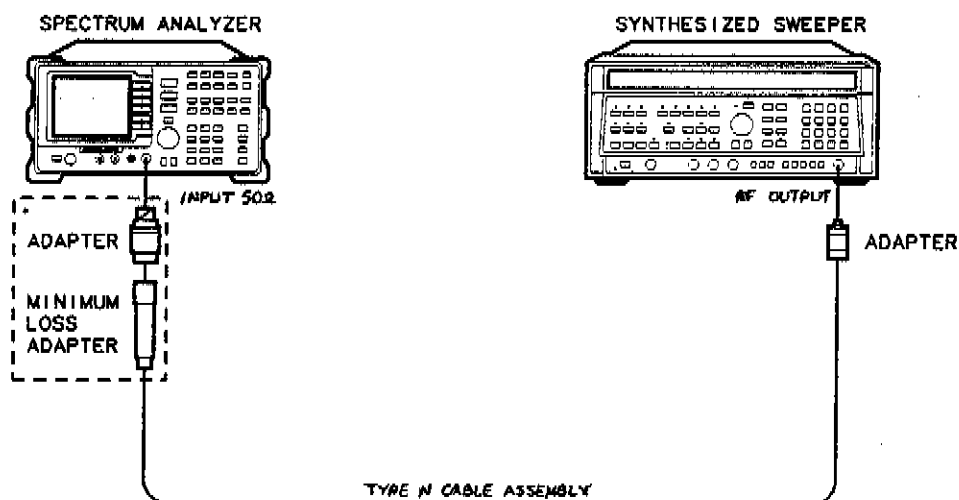
Equipment Required

Synthesized sweeper
Adapter, Type N (f) to APC 3.5 (f)
Cable, Type N, 183 cm (72 in)

Additional Equipment for Option 001

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.



1. OPTION 001 ONLY

XY12

Figure 1-3. Frequency Readout Accuracy Test Setup for Option 713

3. Frequency Readout Accuracy for Option 713

Procedure

1. Connect the equipment as shown in Figure 1-3.
2. Perform the following steps to set up the equipment:
 - Press INSTRUMENT PRESET on the synthesized sweeper, then set the controls as follows:
 - CW 10 MHz
 - POWER LEVEL -10 dBm
 - Press **PRESET** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:
 - FREQUENCY** 10 **MHz**
 - SPAN** 12 **MHz**
3. Set the spectrum analyzer to measure the frequency readout accuracy by pressing the following spectrum analyzer keys:
 - PEAK SEARCH**
 - MKR FCTN** MK TRACK ON OFF (ON)
 - SPAN** 200 **kHz**
4. Record the MKR frequency reading in the performance test record. The reading should be within the limits shown in Table 1-6.
5. Press **SPAN** 12 **MHz** on the spectrum analyzer.
6. Change to the next synthesized sweeper CW and spectrum analyzer center frequencies listed in Table 1-6.
7. Repeat steps 4 through 6 for each frequency setting listed in Table 1-6.

Table 1-6. Frequency Readout Accuracy

Synthesized Sweeper CW Frequency (MHz)	Spectrum Analyzer Center Frequency (MHz)	MKR Reading (MHz)		
		Min	TR Entry (Actual)	Max
10	10	4.9980	1	15.0020
50	50	44.9980	2	55.0020
100	100	94.9980	3	105.0020
500	500	494.9980	4	505.0020
1000	1000	994.9980	5	1005.0020
1800	1800	1794.9980	6	1805.0020

4. Noise Sidebands

A 500 MHz CW signal is applied to the input of the spectrum analyzer. The marker functions are used to measure the amplitude of the carrier and the noise level 30 kHz above and below the carrier. The difference between these two measurements is compared to specification.

There are no related adjustment procedures for this performance test.

Equipment Required

Signal generator
Cable, Type N, 183 cm (72 in)

Additional Equipment for Option 001

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

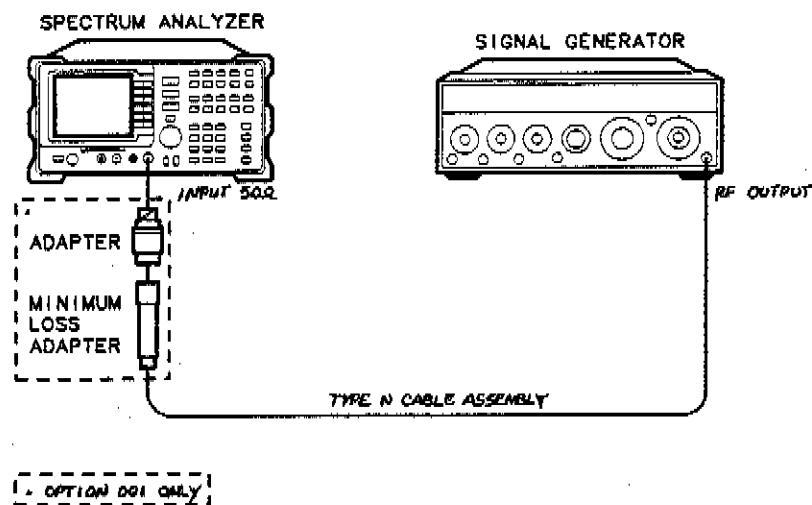


Figure 1-4. Noise Sidebands Test Setup

4. Noise Sidebands

Procedure

1. Perform the following steps to set up the equipment:

- Set the signal generator controls as follows:

FREQUENCY	500 MHz
OUTPUT LEVEL	0 dBm
AM	OFF
FM	OFF
COUNTER	INT
RF	ON

- Connect the equipment as shown in Figure 1-4.

- Press **PRESET** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

FREQUENCY 500 **MHz**
SPAN 10 **MHz**

2. Calculate the Noise Sideband Suppression by performing the following steps:

- Press the following spectrum analyzer keys:

PEAK SEARCH
MKR FCTN MK TRACK ON OFF (ON)
SPAN 200 **kHz**
BW 1 **kHz**
VID BW AUTO MAN 30 **Hz**
MKR FCTN MK TRACK ON OFF (OFF)
SGL SWP
PEAK SEARCH

Record the MKR amplitude reading in the Noise Sideband Worksheet as the Carrier Amplitude.

4. Noise Sidebands

- Press the following spectrum analyzer keys:

MARKER Δ 30 (kHz)

(MKR) MARKER NORMAL

Record the MKR amplitude reading in the Noise Sideband Worksheet as the Noise Sideband Level at +30 kHz.

- Press the following spectrum analyzer keys:

(PEAK SEARCH)

MARKER Δ -30 (kHz)

(MKR) MARKER NORMAL

Record the MKR amplitude reading in the Noise Sideband Worksheet as the Noise Sideband Level at -30 kHz.

Noise Sideband Worksheet

Description	Measurement
Carrier Amplitude	_____ dBm or dBmV
Noise Sideband Level at +30 kHz	_____ dBm or dBmV
Noise Sideband Level at -30 kHz	_____ dBm or dBmV
Maximum Sideband Level	_____ dBm or dBmV

- Record the more positive value, either Noise Sideband Level at +30 kHz or Noise Sideband Level at -30 kHz from above in the Noise Sideband Worksheet as the Maximum Noise Sideband Level.

- Subtract the Carrier Amplitude from the Maximum Noise Sideband Level using the equation below.

$$\text{Noise Sideband Suppression} = \text{Maximum Noise Sideband Level} - \text{Carrier Amplitude}$$

- Record the Noise Sideband Suppression in the performance test record as TR Entry 1. The suppression should be ≤ -65 dBc.

The resolution bandwidth is normalized to 1 Hz as follows:

$$1 \text{ Hz noise-power} = (\text{noise-power in dBc}) - (10 \times \log(\text{RBW}))$$

For example, -65 dBc in a 1 kHz resolution bandwidth is normalized to -95 dBc/Hz.

5. System Related Sidebands

5. System Related Sidebands

A 500 MHz CW signal is applied to the input of the spectrum analyzer. The marker functions are used to measure the amplitude of the carrier and the amplitude of any system related sidebands 30 kHz above and below the carrier. System related sidebands are any internally generated line related, power supply related or local oscillator related sidebands.

There are no related adjustment procedures for this performance test.

Equipment Required

Signal generator
Cable, Type N, 183 cm (72 in)

Additional Equipment for Option 001

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

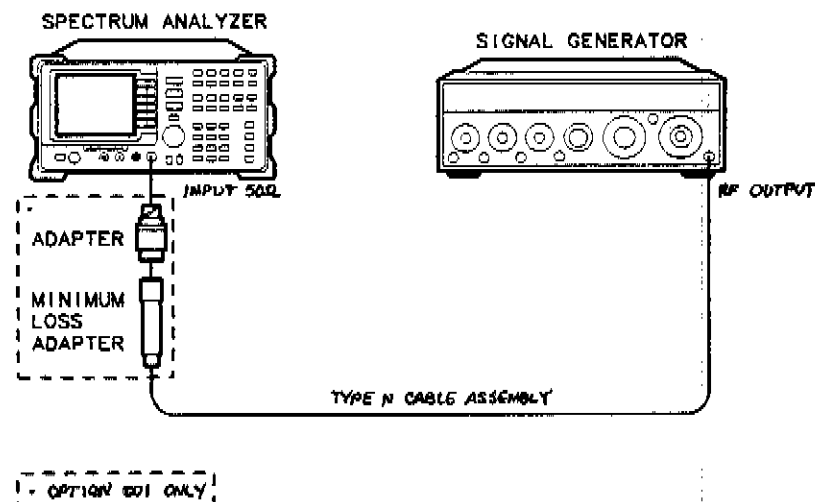


Figure 1-5. System Related Sidebands Test Setup

5. System Related Sidebands

Procedure

1. Perform the following steps to set up the equipment:

- Set the signal generator controls as follows:

FREQUENCY		500 MHz
OUTPUT LEVEL		0 dBm
AM		OFF
FM		OFF
COUNTER		INT
RF		ON

- Connect the equipment as shown in Figure 1-5.
- Press **PRESET** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

FREQUENCY 500 **(MHz)**
SPAN 10 **(MHz)**

2. Set the spectrum analyzer to measure the system related sideband above the signal by performing the following steps:

PEAK SEARCH
MKR FCTN MK TRACK ON OFF **(ON)**
SPAN 200 **(kHz)**
BW 1 **(kHz)**
VID BW AUTO MAN 30 **(Hz)**

Allow the spectrum analyzer to stabilize for approximately 1 minute. Then press the following keys:

MKR FCTN MK TRACK ON OFF **(OFF)**
FREQUENCY CF STEP AUTO MAN 130 **(kHz)**

3. Press **SGL SWP** and wait for the completion of the sweep. Press **PEAK SEARCH**, then **MARKER Δ**.
4. Press the following spectrum analyzer keys:

FREQUENCY
(↑) (step-up key)

5. Measure the system related sideband above the signal by pressing **SGL SWP** on the spectrum analyzer. Wait for the completion of a new sweep, then press **PEAK SEARCH**.
6. Record the Marker Δ Amplitude in TR Entry 1 of the performance test record.

The Marker Δ Amplitude above the signal should be < -65 dB.

7. Set the spectrum analyzer to measure the system related sideband below the signal by pressing the following spectrum analyzer keys:

(↓) (step-down key)
(↓) (step-down key)

8. Measure the system related sideband below the signal by pressing **SGL SWP**. Wait for the completion of a new sweep, then press **PEAK SEARCH**.

Record the Marker Δ Amplitude in TR Entry 2 of the performance test record.

The Marker Δ Amplitude below the signal should be < -65 dB.

6. Frequency Span Readout Accuracy

There are no related adjustment procedures for this performance test.

Synthesized sweeper
Signal generator
Power splitter
Adapter, Type N (m) to Type N (m)
Adapter, Type N (f) to APC 3.5 (m)
Cable, Type N, 183 cm (72 in)
Cable, Type N, 152 cm (60 in)

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

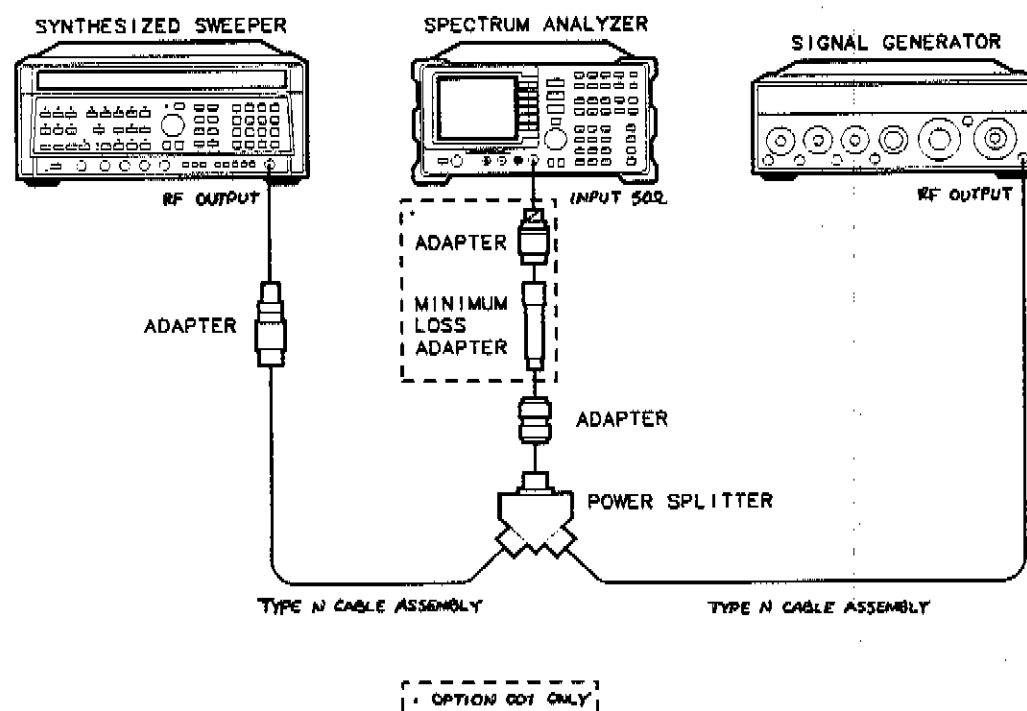


Figure 1-6. Frequency Span Accuracy Test Setup

6. Frequency Span Readout Accuracy

Procedure

This performance test consists of two parts:

- Part 1: Span 1800 MHz
- Part 2: Spans <500 MHz

Perform "Part 1: Span 1800 MHz" before "Part# 2: Spans <500 MHz."

Part 1: Span 1800 MHz

1. Connect the equipment as shown in Figure 1-6. Note that the power splitter is used as a combiner.
2. Press **[PRESET]** on the spectrum analyzer and wait for the preset to finish. Set the spectrum analyzer by pressing the following keys:
[FREQUENCY] 900 [MHz]
[SPAN] 1800 [MHz]
3. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:
CW 1100 MHz
POWER LEVEL -5 dBm
4. On the signal generator, set the controls as follows:
FREQUENCY (LOCKED MODE) 200 MHz
CW OUTPUT 0 dBm
5. Adjust the spectrum analyzer center frequency, if necessary, to place the lower frequency on the second vertical graticule line (one division from the left-most graticule line).
6. Press **[SGL SWP]** then **[PEAK SEARCH]**. If necessary, continue pressing **NEXT PEAK** until the marker is on the left-most signal. This is the "marked" signal.
7. Press **MARKER Δ** and continue pressing **NEXT PK RIGHT**. The marker delta should be on the right-most signal.
8. Record the MKR Δ frequency reading in the performance test record for the corresponding TR Entry listed in Table 1-7. The MKR reading should be within the limits shown.

6. Frequency Span Readout Accuracy

Part 2: Spans <500 MHz

9. Press **PRESET** on the spectrum analyzer and wait for the PRESET to finish. Set the spectrum analyzer by pressing the following keys:

FREQUENCY 70 **MHz**
SPAN 100 **MHz**

10. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:

CW 110 MHz
 POWER LEVEL -5 dBm

11. Set the signal generator controls as follows:

FREQUENCY 30 MHz
 CW OUTPUT 0 dBm

12. If necessary, adjust the spectrum analyzer center frequency to center the two signals on the display.

13. On the spectrum analyzer, press the following keys:

PEAK SEARCH **MARKER Δ**
NEXT PEAK

The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).

14. Record the MKR Δ frequency reading in the performance test record for the corresponding TR Entry listed in Table 1-7. The MKR reading should be within the limits shown.
15. On the spectrum analyzer, press **MKR**, More 1 of 2, then **MARKER ALL OFF**.
16. Repeat steps 11 through 15 for the remaining span settings listed in Table 1-7, setting the synthesized sweeper CW and signal generator Frequency as shown in the table.

Table 1-7. Frequency Span Readout Accuracy

Spectrum Analyzer Span Setting	Signal Generator Frequency (MHz)	Synthesized Sweeper Frequency (MHz)	MKR-Δ Reading		
			Min.	TR Entry (Actual)	Max.
1800 MHz	200	1700	1446 MHz	1	1554 MHz
100 MHz	30.0	110.0	77.0 MHz	2	83.0 MHz
20 MHz	62.0	78.0	15.40 MHz	3	16.60 MHz
10 MHz	66.0	74.0	7.70 MHz	4	8.30 MHz
100 kHz	69.96	70.04	77.0 kHz	5	83.0 kHz

7. Sweep Time Accuracy

This test uses a synthesizer function generator to amplitude modulate a 500 MHz CW signal from another signal generator. The spectrum analyzer demodulates this signal in zero span to display the response in the time domain. The marker delta frequency function on the spectrum analyzer is used to read out the sweep time accuracy.

There are no related adjustment procedures for this performance test.

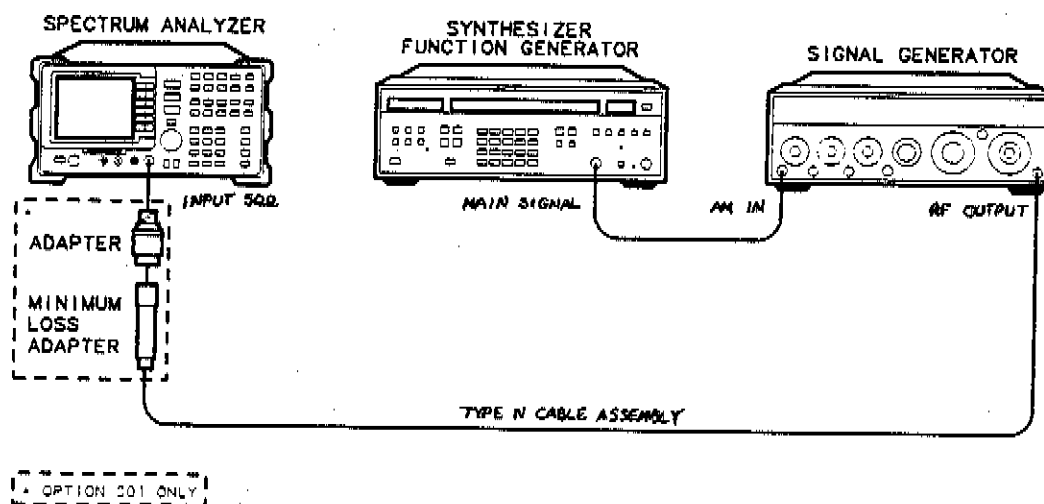
Equipment Required

Synthesizer/function generator
Signal generator
Cable, Type N, 152 cm (60 in)
Cable, BNC, 120 cm (48 in)

Additional Equipment for Option 001

Adapter, minimum loss
Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.



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Figure 1-7. Sweep Time Accuracy Test Setup

Procedure

1. Set the signal generator to output a 500 MHz, -10 dBm, CW signal. Set the AM and FM controls to OFF.
Option 001 only: Set the output to -4 dBm.
2. Set the synthesizer function generator to output a 500 Hz, +5 dBm triangle waveform signal.
3. Connect the equipment as shown in Figure 1-7.

7. Sweep Time Accuracy

- Press **PRESET** on the spectrum analyzer and wait for the preset to finish. Set the controls as follows:

FREQUENCY 500 **MHz**
SPAN 10 **MHz**
PEAK SEARCH
MKR FCTN MK TRACK ON OFF (ON)
SPAN 50 **kHz**

Wait for the AUTO ZOOM routine to finish then press the following spectrum analyzer keys:

SPAN ZERO SPAN
BW 3 **MHz**
AMPLITUDE SCALE LOG LIN (LIN)
SWEEP TIME 20 **ms**

Adjust signal amplitude for a mid-screen display.

- Set the signal generator AM switch to the AC position.
- On the spectrum analyzer, press the following keys:

TRIG VIDEO

Adjust the video trigger so that the spectrum analyzer is sweeping.

- Press **SGL SWP**. After the completion of the sweep, press **PEAK SEARCH**. If necessary, press **NEXT PEAK** until the marker is on the left most signal. This is the "marked signal."
- Press **MARKER Δ**, **MARKER Δ**, then **NEXT PK RIGHT** until the marker Δ is on the eighth signal peak. Record the marker Δ reading in the performance test record as indicated in Table 1-8.
- Repeat steps 6 through 8 for the remaining sweep time settings listed in Table 1-8.

Table 1-8. Sweep Time Accuracy

Spectrum Analyzer Sweep Time Setting	Synthesizer/Level Generator Frequency	Minimum Reading	TR Entry (MKR Δ)	Maximum Reading
20 ms	500 Hz	15.4 ms	1	16.6 ms
100 ms	100 Hz	77.0 ms	2	83.0 ms
1 s	10 Hz	770.0 ms	3	830.0 ms
10 s	1 Hz	7.7 s	4	8.3 s

8. Scale Fidelity

A 50 MHz CW signal is applied to the INPUT 50 Ω of the analyzer through two step attenuators. The attenuators increase the effective amplitude range of the source. The amplitude of the source is decreased in 10 dB steps and the analyzer marker functions are used to measure the amplitude difference between steps. The source's internal attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

The related adjustment for this performance test is "Log and Linear Amplitude Adjustment."

Equipment Required

- Synthesizer/level generator
- Attenuator, 1 dB step
- Attenuator, 10 dB step
- Cable, BNC, 122 cm (48 in)
- Cable, BNC, 20 cm (9 in)
- Adapter, Type N (m) to BNC (f)
- Adapter, Type BNC (m) to BNC (m)

Additional Equipment for Option 001

- Adapter, minimum loss
- Adapter, Type N (f) to BNC (m), 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

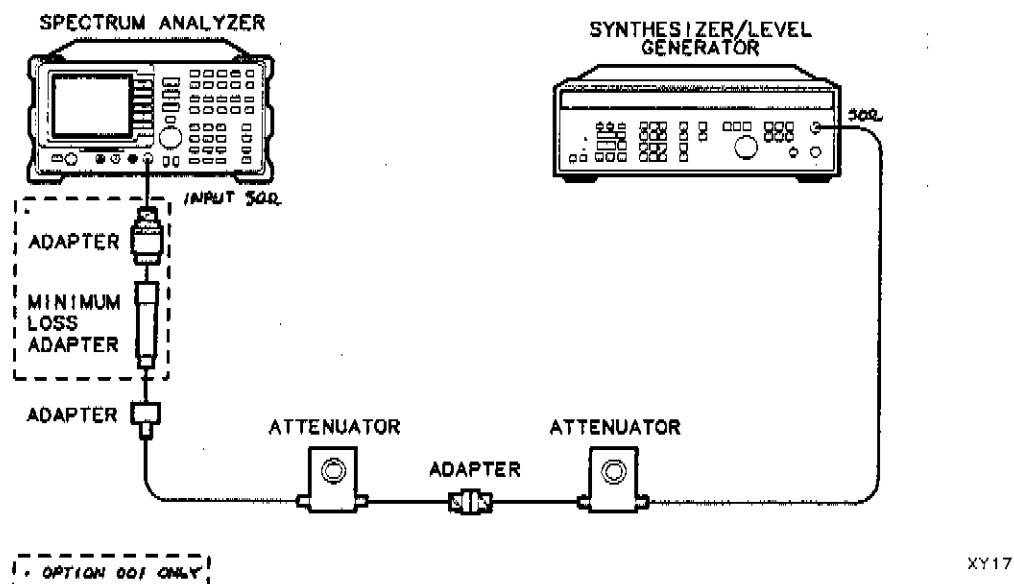


Figure 1-8. Scale Fidelity Test Setup

Procedure

Log Scale

1. Set the synthesizer/level generator controls as follows:

FREQUENCY 50 MHz
 AMPLITUDE +10 dBm
 AMPTD INCR 0.05 dB
 OUTPUT 50 Ω

2. Connect the equipment as shown in Figure 1-8. Set the 10 dB step attenuator to 10 dB attenuation and the 1 dB step attenuator to 0 dB attenuation.

Option 001 only: Set the attenuation of the 10 dB step attenuator to 0 dB. Connect the minimum loss pad to the INPUT 75 Ω using adapters.

3. Press **[PRESET]** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

[FREQUENCY] 50 **[MHz]**
[SPAN] 10 **[MHz]**

Option 001 only: Press **[AMPLITUDE]**, More 1 of 2, Amptd Units, then dBm.

[PEAK SEARCH]
[MKR FCTN] MK TRACK ON OFF (ON)
[SPAN] 50 **[kHz]**

Wait for the auto zoom routine to finish, then set the resolution bandwidth and the video bandwidth by pressing the following keys:

[BW]
 RES BW AUTO MAN 3 **[kHz]**
 VID BW AUTO MAN 30 **[Hz]**

4. If necessary, adjust the 1 dB step attenuator attenuation until the MKR amplitude reads between 0 dBm and -1 dBm.
5. On the synthesizer/level generator, press AMPLITUDE and use the increment keys to adjust the amplitude until the spectrum analyzer MKR amplitude reads 0 dBm ± 0.05 dB.
It may be necessary to decrease the resolution of the amplitude increment of the synthesizer/level generator to 0.01 dB to obtain a MKR reading of 0 dBm ± 0.05 dB.
6. On the spectrum analyzer, press **[PEAK SEARCH]** then **MARKER Δ** .
7. Set the synthesizer/level generator AMPTD INCR to 4 dB.
8. On the synthesizer/level generator, press AMPLITUDE, then increment down to step the synthesizer/level generator to the next lowest nominal amplitude listed in Table 1-9.
9. Record the Actual MKR Δ amplitude reading in the performance test record as indicated in Table 1-9. The MKR amplitude should be within the limits shown.
10. Repeat steps 8 through 9 for the remaining synthesizer/level generator Nominal Amplitudes listed in Table 1-9.

8. Scale Fidelity

11. For each Actual MKR Δ reading recorded in Table 1-9, subtract the previous Actual MKR Δ reading. Add 4 dB to the number and record the result as the incremental error in the performance test record as indicated in Table 1-9. The incremental error should not exceed 0.4 dB/4 dB.

Table 1-9. Cumulative and Incremental Error, Log Mode

Synthesizer/Level Generator Nominal Amplitude (dBm)	dB from Ref Level (nominal)	TR Entry Cumulative Error (MKR Δ Reading)			TR Entry (Incremental Error)
		Min. (dB)	Actual (dB)	Max. (dB)	TR Entry
+10	0	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)
+6	-4	-4.44	1	-3.56	18
+2	-8	-8.48	2	-7.52	19
-2	-12	-12.52	3	-11.48	20
-6	-16	-16.56	4	-15.44	21
-10	-20	-20.60	5	-19.40	22
-14	-24	-24.64	6	-23.36	23
-18	-28	-28.68	7	-27.32	24
-22	-32	-32.72	8	-31.28	25
-26	-36	-36.76	9	-35.24	26
-30	-40	-40.80	10	-39.20	27
-34	-44	-44.84	11	-43.16	28
-38	-48	-48.88	12	-47.12	29
-42	-52	-52.92	13	-51.08	30
-46	-56	-56.96	14	-55.04	31
-50	-60	-61.00	15	-59.00	32
-54	-64	-65.04	16	-62.96	N/A
-68	-68	-69.08	17	-66.92	N/A

Linear Scale

12. Set the synthesizer/level generator controls as follows:

AMPLITUDE +10 dBm
 AMPTD INCR 0.05 dB

13. Set the 1 dB step attenuator to 0 dB attenuation.

8. Scale Fidelity

14. Press **(PRESET)** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

(AMPLITUDE) SCALE LOG LIN (LIN)

Option 001 only: Press More 1 of 2, INPUT Z 50 Ω 75 Ω (50 Ω).

(FREQUENCY) 50 (MHz)

(SPAN) 10 (MHz)

(PEAK SEARCH)

(MKR FCTN) MK TRACK ON OFF (ON)

(SPAN) 50 (kHz)

Wait for the auto zoom routine to finish, then set the resolution bandwidth and the video bandwidth by pressing the following keys:

(BW)

RES BW AUTO MAN 3 (kHz)

VID BW AUTO MAN 30 (Hz)

15. If necessary, adjust the 1 dB step attenuator attenuation until the MKR reads approximately 223.6 mV. It may be necessary to decrease the resolution of the amplitude increment of the synthesizer/level generator to 0.01 dB to obtain a MKR reading of $223.6 \text{ mV} \pm 0.4 \text{ mV}$.
16. On the synthesizer/level generator, press **AMPLITUDE**, then use the increment keys to adjust the amplitude until the spectrum analyzer MKR amplitude reads $223.6 \text{ mV} \pm 0.4 \text{ mV}$.
17. On the spectrum analyzer, press **(PEAK SEARCH)**, **(MKR FCTN)**, then **MK TRACK ON OFF (OFF)**.
18. Set the synthesizer/level generator amplitude increment to 3 dB.
19. On the synthesizer/level generator, press **AMPLITUDE**, then increment down to step the synthesizer/level generator to the next lowest Nominal Amplitude listed in Table 1-10.
20. Record the MKR amplitude reading in the performance test record as indicated in Table 1-10. The MKR amplitude should be within the limits shown.
21. Repeat steps 21 and 22 for the remaining synthesizer/level generator Nominal Amplitudes listed in Table 1-10.

Table 1-10. Scale Fidelity, Linear Mode

Synthesizer/Level Generator Nominal Amplitude	% of Ref Level (nominal)	MKR Reading		
		Min. (mV)	TR Entry	Max. (mV)
+10 dBm	100	0 (Ref)	0 (Ref)	0 (Ref)
-7 dBm	70.7	151.59	33	165.01
-4 dBm	50	105.36	34	118.78
-1 dBm	35.48	72.63	35	86.05
-2 dBm	25	49.46	36	82.88

8. Scale Fidelity

Log to Linear Switching

22. Set the 10 dB step attenuator to 10 dB attenuation and the 1 dB step attenuator to 0 dB attenuation.

23. Set the synthesizer controls as follows:

FREQUENCY 50 MHz
AMPLITUDE +6 dBm

24. On the spectrum analyzer, press **PRESET**, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

FREQUENCY 50 **MHz**
SPAN 10 **MHz**
BW 300 **kHz**

25. On the spectrum analyzer, press the following keys:

PEAK SEARCH
MKR **→** **MARKER** **→** **REF LVL**
PEAK SEARCH

26. Record the peak marker reading in Log mode below.

Log Mode Amplitude Reading _____ dBm

27. Press **AMPLITUDE** **SCALE LOG LIN** (**LIN**) to change the scale to linear, then press **More 1 of 2**, **Amptd Units**, and **dBm** to set the amplitude units to dBm.

28. Press **PEAK SEARCH**, then record the peak marker amplitude reading in linear mode.

Linear Mode Amplitude Reading _____ dBm

29. Subtract the Linear Mode Amplitude Reading from the Log Mode Amplitude Reading, then record this value as the Log/Linear Error.

Log/Linear Error _____ dB

30. If the Log/Linear Error is less than 0 dB, record this value as TR Entry 37 in the performance test record. The absolute value of the reading should be less than 0.25 dB. If the Log/Linear Error is greater than 0 dB, continue with the next step.

31. On the spectrum analyzer, press the following keys:

MKR **→** **MARKER** **→** **REF LVL**
PEAK SEARCH

32. Record the peak marker amplitude reading in linear mode.

Linear Mode Amplitude Reading _____ dBm

33. On the spectrum analyzer, press the following keys:

AMPLITUDE **SCALE LOG LIN** (**LOG**)
PEAK SEARCH

8. Scale Fidelity

34. Record the peak marker reading in Log mode below.

Log Mode Amplitude Reading _____ dBm

35. Subtract the Log Mode Amplitude Reading from the Linear Mode Amplitude Reading, then record this value as the Linear/Log Error.

Linear/Log Error _____ dB

36. Record the Linear/Log Error as TR Entry 37 in the performance test record. The absolute value of the reading should be less than 0.25 dB.

9. Reference Level Accuracy

A 50 MHz CW signal is applied to the INPUT 50 Ω of the spectrum analyzer through two step attenuators. The attenuators increase the effective amplitude range of the source. The amplitude of the source is decreased in 10 dB steps and the spectrum analyzer marker functions are used to measure the amplitude difference between steps. The source's internal attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

It is only necessary to test reference levels as low as -90 dBm (with 10 dB attenuation) since lower reference levels are a function of the spectrum analyzer microprocessor manipulating the trace data. There is no error associated with the trace data manipulation.

The related adjustment for this procedure is "A12 Cal Attenuator Error Correction."

Equipment Required

- Synthesizer/level generator
- Attenuator, 1 dB steps
- Attenuator, 10 dB steps
- Cable, BNC 122 cm (48 in) (*two required*)
- Adapter, Type N (m) to BNC (f)
- Adapter, BNC (m) to BNC (m)

Additional Equipment for Option 001

- Adapter, minimum loss
- Adapter, Type N (f) to BNC (m) 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

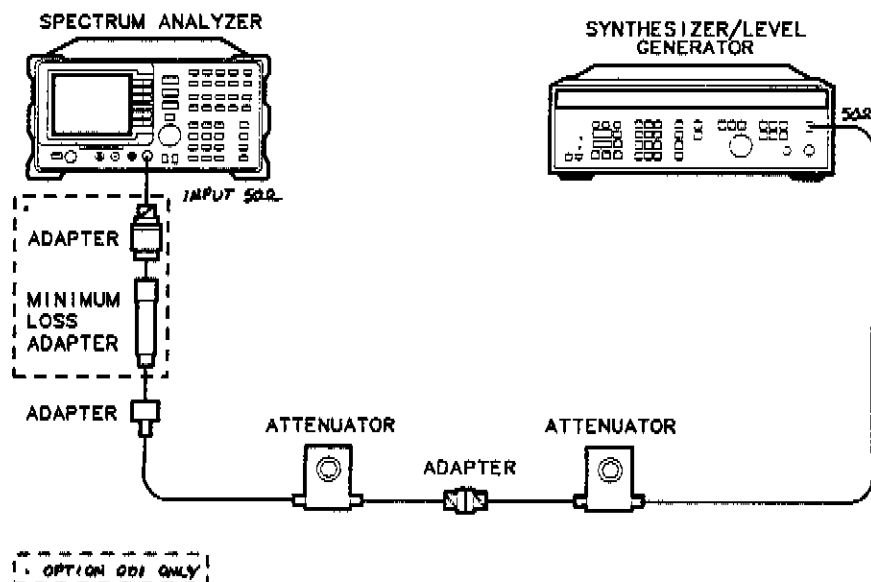


Figure 1-9. Reference Level Accuracy Test Setup

Procedure

Log Scale

1. Set the synthesizer/level generator controls as follows:

FREQUENCY 50 MHz
 AMPLITUDE -10 dBm
 AMPTD INCR 10 dB
 OUTPUT 50 Ω

2. Connect the equipment as shown in Figure 1-9. Set the 10 dB step attenuator to 10 dB attenuation and the 1 dB step attenuator to 0 dB attenuation.

Option 001 only: Connect the minimum loss adapter to the RF input 75 Ω , using adapters, and set the 10 dB step attenuator to 0 dB attenuation.

3. Press **[PRESET]** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer by pressing the following keys:

[FREQUENCY] 50 **[MHz]**
[SPAN] 10 **[MHz]**
[PEAK SEARCH]
[MKR FCTN] MK TRACK ON OFF (ON)
[SPAN] 50 **[kHz]**

Option 001 only: Press **[AMPLITUDE]**, More 1 of 2, Amptd Units, then dBm.

[AMPLITUDE] -20 **[dBm]** SCALE LOG LIN (LOG) 1 **[dB]**
[BW] 3 **[kHz]**
 VID BW AUTO MAN 30 **[Hz]**

4. Set the 1 dB step attenuator to place the signal peak one to two dB (one to two divisions) below the reference level.
5. On the spectrum analyzer, press the following keys:

[SGL SWP]
[PEAK SEARCH] MARKER Δ

6. Set the synthesizer/level generator amplitude and spectrum analyzer reference level according to Table 1-11. At each setting, press **[SGL SWP]** on the spectrum analyzer.
7. Record the MKR Δ amplitude reading in the performance test record as indicated in Table 1-11. The MKR Δ reading should be within the limits shown.

9. Reference Level Accuracy

Table 1-11. Reference Level Accuracy, Log Mode

Synthesizer/Level Generator Amplitude (dBm)	Spectrum Analyzer Reference Level (dBm)	MKR Δ Reading (dB)		
		Min.	TR Entry	Max.
-10	-20	0 (Ref)	0 (Ref)	0 (Ref)
0	-10	-0.4	1	+0.4
+10	0	-0.5	2	-0.5
-20	-30	-0.4	3	+0.4
-30	-40	-0.5	4	+0.5
-40	-50	-0.8	5	+0.8
-50	-60	-1.0	6	+1.0
-60	-70	-1.1	7	+1.1
-70	-80	-1.2	8	+1.2
-80	-90	-1.3	9	+1.3

Linear Scale

8. Set the synthesizer/level generator amplitude to -10 dBm.
9. Set the 1 dB step attenuator to 0 dB attenuation.
10. Set the spectrum analyzer controls as follows:
 - AMPLITUDE** -20 **dBm**
 - SCALE** LOG LIN (LIN)
 - AMPLITUDE** More 1 of 2 Amptd Units dBm
 - SWEEP** SWEEP CONT SGL (CONT)
 - MKR** More 1 of 2 MARKER ALL OFF
11. Set the 1 dB step attenuator to place the signal peak one to two divisions below the reference level.
12. On the spectrum analyzer, press the following keys:
 - SGL SWP**
 - PEAK SEARCH** MARKER Δ
 - MKR FCTN** MK TRACK ON OFF (OFF)
13. Set the synthesizer/level generator amplitude and spectrum analyzer reference level according to Table 1-12. At each setting, press **SGL SWP** on the spectrum analyzer.
14. Record the MKR Δ amplitude reading in Table 1-12. The MKR Δ reading should be within the limits shown.

9. Reference Level Accuracy

Table 1-12. Reference Level Accuracy, Linear Mode

Synthesizer/Level Generator Amplitude	Spectrum Analyzer Reference Level	MKR Δ Reading (dB)		
		Min.	TR Entry	Max.
-10	-20	0 (Ref)	0 (Ref)	0 (Ref)
0	-10	-0.4	10	+0.4
+10	0	-0.5	11	+0.5
-20	-30	-0.4	12	+0.4
-30	-40	-0.5	13	+0.5
-40	-50	-0.8	14	+0.8
-50	-60	-1.0	15	+1.0
-60	-70	-1.1	16	+1.1
-70	-80	-1.2	17	+1.2
-80	-90	-1.3	18	+1.3

10. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties

To measure the absolute amplitude calibration uncertainty the input signal is measured after the self-cal routine is finished.

To measure the resolution bandwidth switching uncertainty an amplitude reference is taken with the resolution bandwidth set to 3 kHz using the marker-delta function. The resolution bandwidth is changed to settings between 3 MHz and 1 kHz and the amplitude variation is measured at each setting and compared to the specification. The span is changed as necessary to maintain approximately the same aspect ratio.

The related adjustment procedure for this performance test is "Crystal and LC Bandwidth Adjustment."

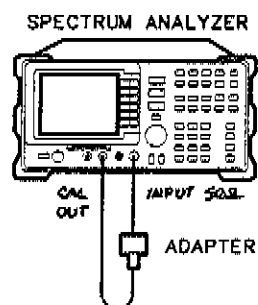
Equipment Required

- Cable, BNC, 23 cm (9 in)
- Adapter, Type N (m) to BNC (f)

Additional Equipment for Option 001

- Cable, BNC, 75 Ω , 30 cm (12 in)

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.



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Figure 1-10. Uncertainty Test Setup

10. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties

Procedure

1. Connect the CAL OUT to the spectrum analyzer input using the BNC cable and adapter, as shown in Figure 1-10.

Option 001 only: Use the 75 Ω cable and omit the adapter.

2. Press **[PRESET]** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer controls by pressing the following keys:

[SPAN] 10 **[MHz]**
[PEAK SEARCH]
[MKR FCTN] MK TRACK ON OFF (ON)
[FREQUENCY] 300 **[MHz]**
[SPAN] 50 **[kHz]**
[BW] 3 **[kHz]**
VID BW AUTO MAN 300 **[Hz]**

Option 001 only: Press **[AMPLITUDE]**, More 1 of 2, Amptd Units, then dBm.

[AMPLITUDE] -20 **[dBm]**

3. Press **[PEAK SEARCH]**, then record the marker reading in TR Entry 1 of the performance test record.

The marker reading should be within -20.15 and -19.85 dB.

4. Press **[PRESET]** on the spectrum analyzer, then wait for the preset routine to finish. Set the spectrum analyzer controls by pressing the following keys:

[FREQUENCY] 300 **[MHz]**
[SPAN] 10 **[MHz]**
[PEAK SEARCH]
[MKR FCTN] MK TRACK ON OFF (ON)

Option 001 only: Press **[AMPLITUDE]**, More 1 of 2, Amptd Units, then dBm.

[SPAN] 50 **[kHz]**
[AMPLITUDE] -20 **[dBm]**
SCALE LOG LIN (LOG) 1 **[dB]**
[BW] 3 **[kHz]**
VID BW AUTO MAN 1 **[kHz]**

5. Press **[AMPLITUDE]** and use the knob to adjust the reference level until the signal appears one division below the reference level, then press the following keys:

[PEAK SEARCH] MARKER Δ
[MKR FCTN] MK TRACK ON OFF (OFF)

6. Set the spectrum analyzer resolution bandwidth and span according to Table 1-13.
7. Press **[PEAK SEARCH]**, then record the MKR Δ TRK amplitude reading in the performance test record as indicated in Table 1-13.

The amplitude reading should be within the limits shown.

8. Repeat steps 6 through 7 for each of the remaining resolution bandwidth and span settings listed in Table 1-13.

10. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties

Table 1-13. Resolution Bandwidth Switching Uncertainty

Spectrum Analyzer		MKR Δ TRK Amplitude Reading		
RES BW Setting	SPAN Setting	Min. (dB)	TR Entry	Max. (dB)
3 kHz	50 kHz	0 (Ref)	0 (Ref)	0 (Ref)
1 kHz	50 kHz	-0.5	2	+0.5
9 kHz	50 kHz	-0.4	3	+0.4
10 kHz	50 kHz	-0.4	4	+0.4
30 kHz	500 kHz	-0.4	5	+0.4
100 kHz	500 kHz	-0.4	6	+0.4
120 kHz	500 kHz	-0.4	7	+0.4
300 kHz	5 MHz	-0.4	8	+0.4
1 MHz	10 MHz	-0.4	9	+0.4
3 MHz	10 MHz	-0.4	10	+0.4

11. Calibrator Amplitude and Frequency Accuracy

This test measures the accuracy of the spectrum analyzer CAL OUT signal. The first part of the test characterizes the insertion loss of a Low-Pass Filter (LPF) and 10 dB attenuator. The harmonics of the CAL OUT signal are suppressed with the LPF before the amplitude accuracy is measured using a power meter. A frequency counter is used to measure the frequency accuracy of the CAL OUT signal and the measured frequency is compared to the specification.

The related adjustments for this procedure are:

- Calibrator Amplitude Adjustment
- Third Converter, 600 MHz Frequency Adjustment

Equipment Required

- Microwave frequency counter
- Low pass filter, 300 MHz
- Synthesized sweeper
- Measuring receiver (used as a power meter)
- Power meter
- Low power sensor with a 50 MHz reference attenuator
- Power sensor
- Power splitter
- 10 dB attenuator, Type N (m to f), dc-12.4 GHz Option 010
- Cable, BNC, 121 cm (48 in)
- Cable, Type N, 152 cm (60 in)
- Adapter, APC 3.5 (f) to Type N (f)
- Adapter, Type N (f) to BNC (m) (2 required)
- Adapter, Type N (m) to BNC (f)

Additional Equipment for Option 001

- Cable, BNC, 75 Ω
- Adapter, Type N (f) to Type N (f), 75 Ω
- Adapter, minimum loss
- Adapter, mechanical, 75 Ω to 50 Ω
- Adapter, Type N (f) 75 Ω to BNC (m) 75 Ω

11. Calibrator Amplitude and Frequency Accuracy

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

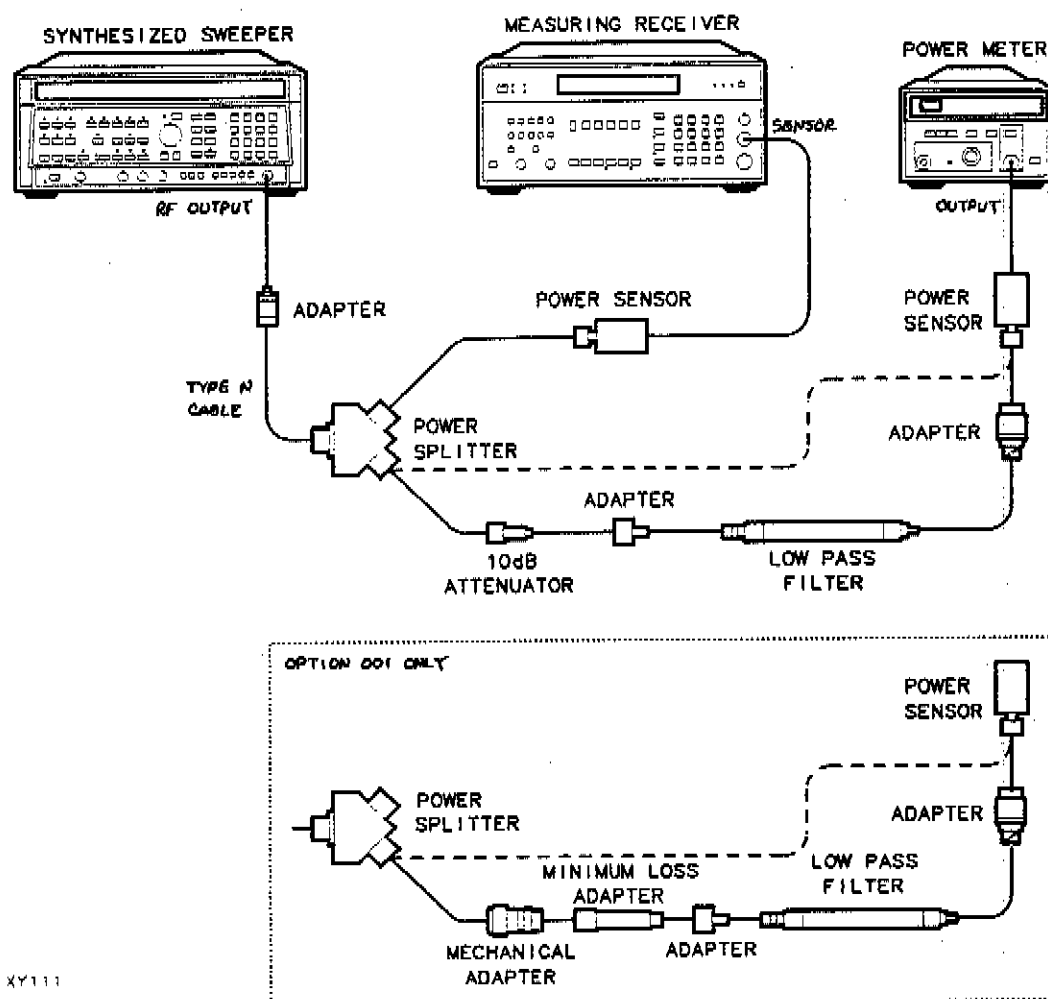


Figure 1-11. LPF Characterization

11. Calibrator Amplitude and Frequency Accuracy

Procedure

Part 1: LPF, Attenuator, and Adapter Insertion Loss Characterization

1. Zero and calibrate the measuring receiver and power sensor in LOG mode as described in the measuring receiver operation manual.

Caution Do not attempt to calibrate the low power sensor without the reference attenuator or damage to the low power sensor will occur.

2. Zero and calibrate the power meter and the low power sensor, as described in the power meter operation manual.
3. Press INSTRUMENT PRESET on the synthesized sweeper. Set the controls as follows:
CW 300 MHz
POWER LEVEL -15 dBm
4. Connect the equipment as shown in Figure 1-11. Connect the low power sensor directly to the power splitter (bypass the LPF, attenuator, and adapters). Allow the power sensors to settle before proceeding.
5. On the measuring receiver, press RATIO mode. Power indication should be 0 dB.
6. On the power meter, press the dB REF mode key. Power indication should be 0 dB.
7. Connect the LPF, attenuator and adapters as shown in Figure 1-11.
8. Record the measuring receiver reading in dB. This is the relative error due to mismatch.

Mismatch Error _____ dB

9. Record the power meter reading in dB. This is the relative uncorrected insertion loss of the LPF, attenuator, and adapters.

Uncorrected Insertion Loss _____ dB

10. Subtract the Mismatch Error (step 8) from the Uncorrected Insertion Loss (step 9). This is the Corrected Insertion Loss.

Corrected Insertion Loss _____ dB

Example: If the Mismatch Error is +0.3 dB and the Uncorrected Insertion Loss is -10.2 dB, subtract the mismatch error from the insertion loss to yield a corrected reading of -10.5 dB.

11. Calibrator Amplitude and Frequency Accuracy

Part 2: Calibrator Amplitude Accuracy

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

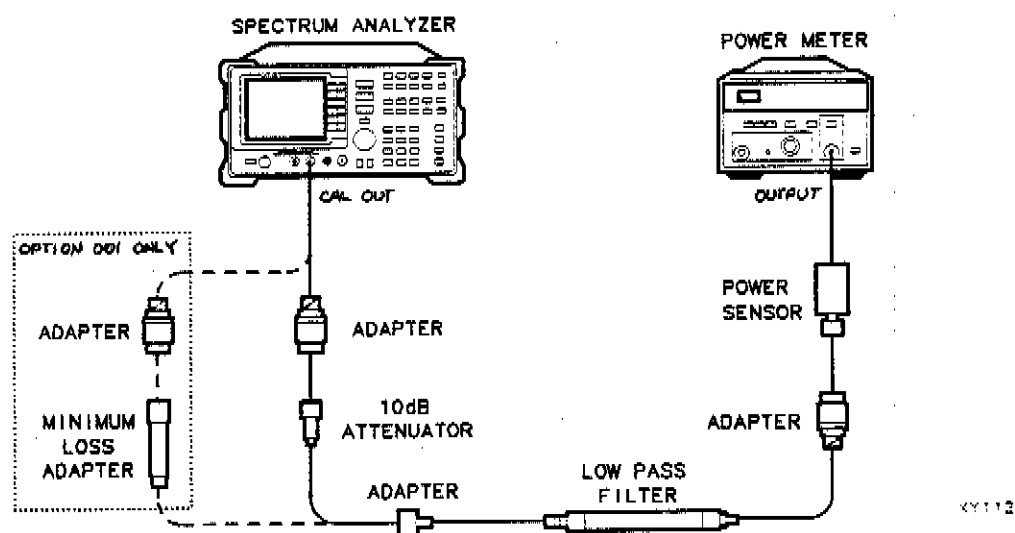


Figure 1-12. Calibrator Amplitude Accuracy Test Setup

11. Connect the equipment as shown in Figure 1-12. The spectrum analyzer should be positioned so that the setup of the adapters, LPF, and attenuator do not bind. It may be necessary to support the center of gravity of the devices.
12. On the power meter, press the dBm mode key. Record the power meter Reading in dBm.

Power Meter Reading _____ dBm

11. Calibrator Amplitude and Frequency Accuracy

13. Subtract the Corrected Insertion Loss (step 10) from the power meter Reading (step 12) and record this value as TR Entry 1 in the performance test record. The CAL OUT should be $-20 \text{ dBm} \pm 0.4 \text{ dB}$.

$$\text{CAL OUT Power} = \text{Power Meter Reading} - \text{Corrected Insertion Loss}$$

Example: If the Corrected Insertion Loss is -10.0 dB , and the measuring receiver reading is -30 dB , then $-30 \text{ dB} - (-10.0 \text{ dB}) = -20 \text{ dB}$

Option 001 only: The CAL OUT power measured on 75Ω instruments will be the same as 50Ω instruments. To convert from dBm to dBmV use the following equation. Record this value as TR Entry 1 in the performance test record.

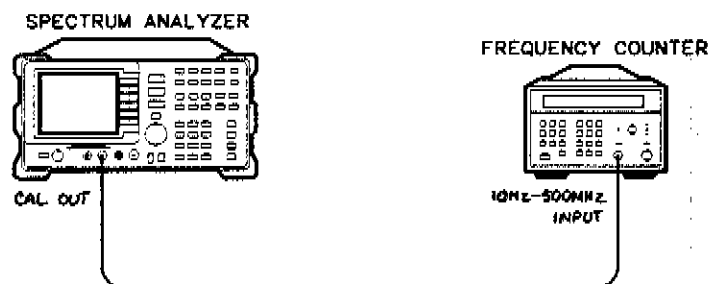
$$\text{dBmV} = \text{dBm} + 48.75 \text{ dB}$$

Example: $-20 + 48.75 = 28.75$.

CAL OUT Power _____ dBmV

Skip Part 3 if your spectrum analyzer is equipped with Option 013 and do performance test number 22 "10 MHz Reference Output Accuracy" instead.

Part 3: Calibrator Frequency Accuracy



XY113

Figure 1-13. Calibrator Frequency Accuracy Test Setup

14. Connect the equipment as shown in Figure 1-13.

Option 001 only: Use a 75Ω cable instead of a 50Ω cable.

15. Set the frequency counter controls as follows:

SAMPLE RATE	Midrange
50 Ω / 1 M Ω SWITCH	50 Ω
10 Hz-500 MHz/500 MHz-26.5 GHz SWITCH	10 Hz-500 MHz

16. Wait for the frequency counter to settle. This may take two or three gate times.
17. Read the frequency counter display. Record this value as TR Entry 2 in the performance test record.

12. Frequency Response

The output of the synthesized sweeper is fed through a power splitter to a power sensor and the spectrum analyzer. The synthesized sweeper's power level is adjusted at 300 MHz to place the displayed signal at the spectrum analyzer center horizontal graticule line. The measuring receiver, used as a power meter, is placed in RATIO mode. At each new sweeper frequency and spectrum analyzer center frequency setting, the sweeper's power level is adjusted to place the signal at the center horizontal graticule line. The measuring receiver displays the inverse of the frequency response relative to 300 MHz (CAL OUT frequency).

Testing the flatness of Option 001, INPUT 75 Ω , is accomplished by first characterizing the system flatness.

The related adjustment for this procedure is the "Frequency Response Error Correction."

Equipment Required

- Synthesized sweeper
- Measuring receiver (used as a power meter)
- Synthesizer/level generator
- Power sensor
- Power splitter
- Adapter, Type N (f) to APC 3.5 (f)
- Adapter, Type N (m) to Type N (m)
- Cable, BNC, 122 cm (48 in)
- Cable, Type N, 183 cm (72 in)

Additional Equipment for Option 001

- Power meter
- Power sensor
- Adapter, Type N (f) 75 Ω to Type N (m) 50 Ω
- Adapter, Type N (m) to BNC (m), 75 Ω
- Cable, BNC, 120 cm (48 in) 75 Ω

System Characterization Procedure for Option 001

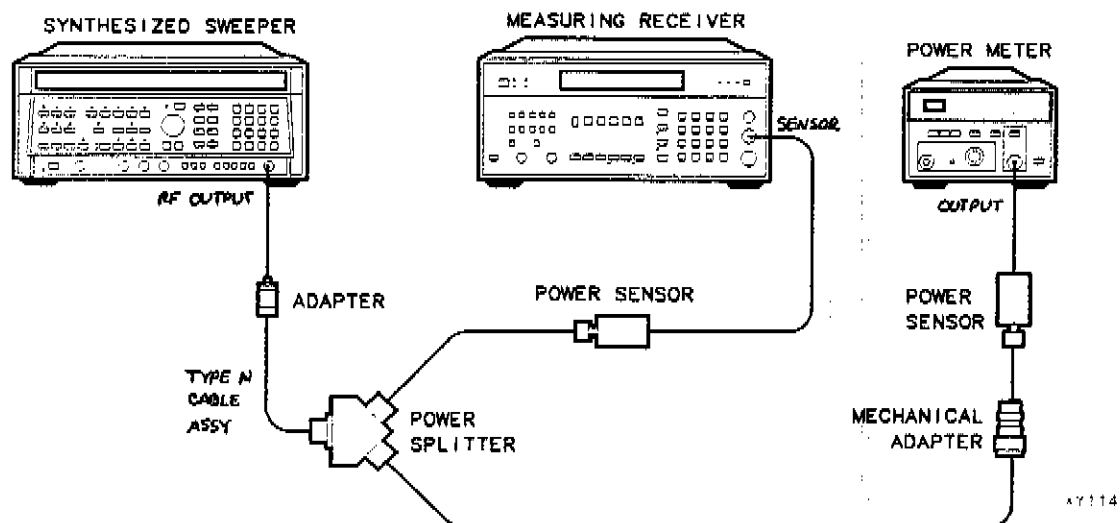


Figure 1-14. System Characterization Test Setup (Option 001)

1. Zero and calibrate the measuring receiver and the power sensor as described in the measuring receiver operation manual.
2. Zero and calibrate the power meter and the power sensor as described in the power meter operation manual.
3. Press INSTRUMENT PRESET on the synthesized sweeper then set the controls as follows:

CW	50 MHz
FREQ STEP	50 MHz
POWER LEVEL	5 dBm
4. Connect the equipment as shown in Figure 1-14.
5. Adjust the synthesized sweeper power level for a 0 dBm reading on the measuring receiver.
6. Record the power meter reading in Column 4 of Table 1-14, taking into account the Cal Factors of both the power sensors.
7. On the synthesized sweeper, press **CW**, and **↑** (step-up key), to step through the remaining frequencies listed in Table 1-14. At each new frequency repeat steps 5 and 6, entering each power sensor's Cal Factor into the respective power meter.

12. Frequency Response

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

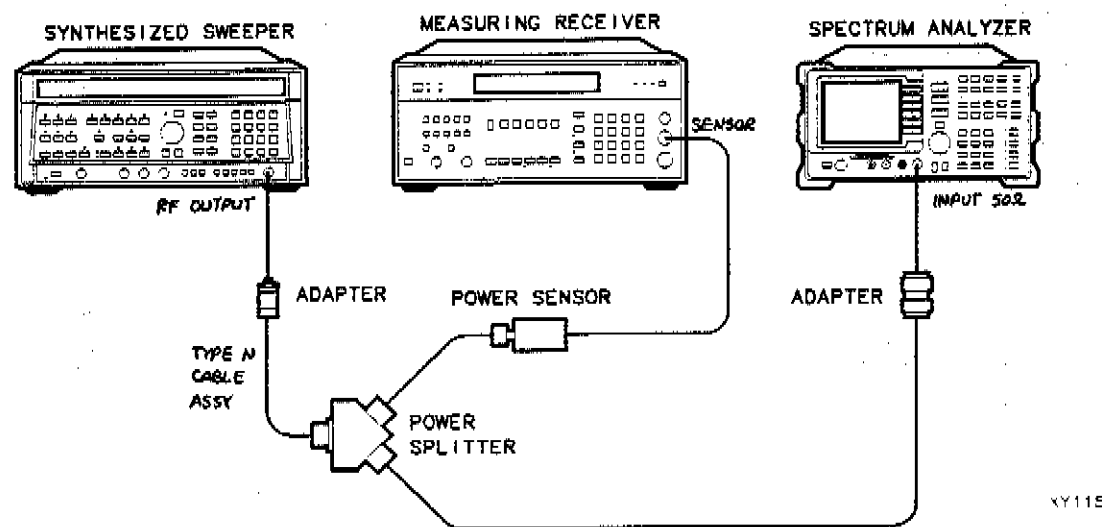


Figure 1-15. Frequency Response Test Setup, ≥ 50 MHz

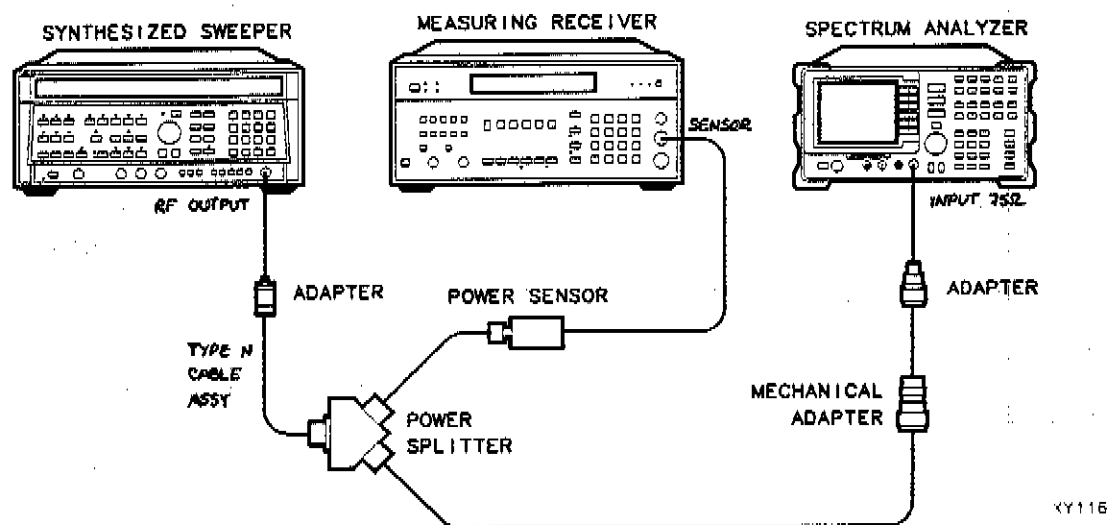


Figure 1-16. Frequency Response Test Setup, ≥ 50 MHz, for Option 001

Procedure

1. Zero and calibrate the measuring receiver and the power sensor in log mode as described in the measuring receiver operation manual.
2. Connect the equipment as shown in Figure 1-15.

Option 001 only: Refer to Figure 1-16.

12. Frequency Response

3. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:
CW 300 MHz
FREQ STEP 50 MHz
POWER LEVEL -8 dBm
4. On the spectrum analyzer, press **PRESET** and wait for the preset to finish. Set the spectrum analyzer controls as follows:
FREQUENCY 300 **MHz**
CF STEP AUTO MAN 50 **MHz**
SPAN 10 **MHz**
*(Option 001 only: Press **AMPLITUDE**, More 1 of 2, Amptd Units, then dBm.)*
AMPLITUDE 10 **-dBm**
SCALE LOG LIN (LOG) 1 **dB**
BW 1 **MHz**
VID BW AUTO MAN 3 **kHz**
5. On the spectrum analyzer, press **PEAK SEARCH**, **MKR FCTN**, then **MK TRACK ON OFF (ON)**.
6. Adjust the synthesized sweeper power level for a MKR-TRK amplitude reading of $-14 \text{ dBm} \pm 0.05 \text{ dB}$.
7. Set the sensor Cal Factor on the measuring receiver and then press **RATIO**.
8. Set the synthesized sweeper CW to 50 MHz.
9. Set the spectrum analyzer center frequency to 50 MHz by pressing **FREQUENCY** 50 **MHz**.
10. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of $-14 \text{ dBm} \pm 0.05 \text{ dB}$.
11. Set the sensor Cal Factor on the measuring receiver and record the negative of the power ratio here and in Table 1-14.

Negative of Measuring Receiver Reading at 50 MHz _____ dB

12. Set the synthesized sweeper CW to 100 MHz.
13. Set the spectrum analyzer center frequency to 100 MHz by pressing **FREQUENCY** 100 **MHz**.
14. Adjust the synthesized sweeper power level for a spectrum analyzer MKR-TRK amplitude reading of $-14 \text{ dBm} \pm 0.05 \text{ dB}$.
15. Set the sensor Cal Factor on the measuring receiver and record the negative of the power ratio displayed on the measuring receiver in Table 1-14 as the Error Relative to 300 MHz.
16. On the synthesized sweeper, press **CW**, and **↑** (step-up key), and on the spectrum analyzer, press **FREQUENCY**, and **↑** (step-up key), to step through the remaining frequencies listed in Table 1-14. At each new frequency repeat steps 14 through 16, entering the power sensor's Cal Factor into the measuring receiver as indicated in Table 1-14.

12. Frequency Response

Frequency Response, (≤ 50 MHz)

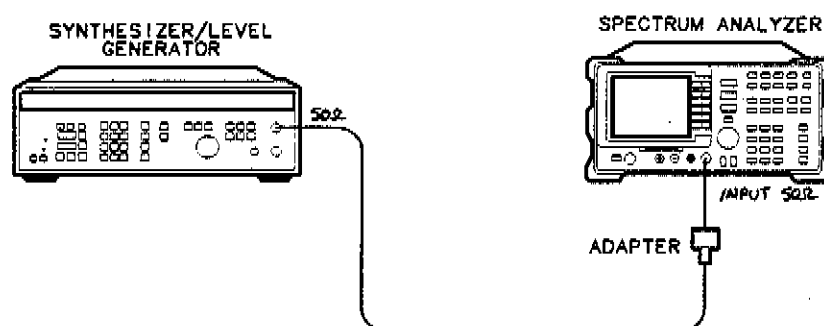


Figure 1-17. Frequency Response Test Setup (<50 MHz)

17. Using a cable, connect the synthesizer/level generator directly to the INPUT 50 Ω . Refer to Figure 1-17.

Option 001 only: Using a 75 Ω cable, connect the synthesizer/level generator from the 75 Ω OUTPUT to the INPUT 75 Ω and set the 50-75 Ω switch to the 75 Ω position.

Set the synthesizer/level generator controls as follows:

FREQUENCY	50 MHz
AMPLITUDE	-15 dBm
AMPTD INCR.....	0.05 dB

18. On the spectrum analyzer press the following keys:

(SPAN) 10 (MHz)
 (FREQUENCY) 50 (MHz)
 (PEAK SEARCH)
 (MKR FCTN) MK TRACK ON OFF (ON)
 (SPAN) 100 (kHz)

Wait for AUTO ZOOM to finish, then press the following spectrum analyzer keys:

(BW) 3 (kHz)
 VID BW AUTO MAN 1 (kHz)

19. Adjust the synthesizer/level generator Amplitude until the MKR-TRK reads -14 dBm. This corresponds to the amplitude at 50 MHz recorded in step 11. Record the synthesizer/level generator amplitude below.

Amplitude Setting (50 MHz) _____ dBm

20. On the spectrum analyzer, press MARKER Δ , (MKR FCTN), then MK TRACK ON OFF (ON).
21. Set the synthesizer/level generator frequency to 20 MHz.
22. On the spectrum analyzer, press the following keys:

(FREQUENCY)
 CF STEP AUTO MAN 30 (MHz)
 (FREQUENCY)
 (↓) (step-down key)

12. Frequency Response

23. Adjust the synthesizer/level generator amplitude for a MKR Δ -TRK amplitude reading of 0.00 ± 0.05 dB. Record this amplitude setting in Table 1-15 in Column 2 at 20 MHz.
24. Repeat steps 21 through 23 for each of the frequencies listed in Table 1-15. Change the spectrum analyzers's center frequency step size to the relative frequency change for each new frequency (for example, use 10 MHz CF STEP size when changing from 20 MHz to 10 MHz).

Option 001 only: Do not test below 1 MHz.

When measuring the 50 kHz center-frequency flatness and below, there will be two signals on screen, the LO feedthrough and the signal from the synthesizer/level generator. Ensure that the marker is on the signal from the synthesizer/level generator (to the right of the LO feed through).

25. For each of the frequencies in Table 1-15, subtract the synthesizer/level generator Amplitude Reading (column 2) from the synthesizer/level generator Amplitude setting (50 MHz) recorded in step 19. Record the result as the Response Relative to 50 MHz (column 3) in Table 1-15.
26. Add to each of the Response Relative to 50 MHz entries in Table 1-15 the measuring receiver Reading at 50 MHz recorded in step 11. Record the results as the Response Relative to 300 MHz (column 4) in Table 1-15.
27. *Option 001 only:* Starting with the error at 50 MHz, subtract Column 4 (System Error) to Column 2 (Error Relative to 300 MHz) and record the result in Column 5 (Corrected Error Relative to 300 MHz).

Test Results

Perform the following steps to verify the frequency response of the spectrum analyzer.

1. Enter the most positive number from Table 1-15, column 4: _____ dB
2. Enter the most positive number from Table 1-14, column 2: _____ dB
(*Option 001 only:* Use column 5.)
3. Record the more positive of numbers from steps 1 and 2 in TR Entry 1 of the performance test record.
4. Enter the most negative number from Table 1-15, column 4: _____ dB
5. Enter the most negative number from Table 1-14, column 2: _____ dB
(*Option 001 only:* Use column 5.)
6. Record the more negative of numbers from steps 4 and 5 in TR Entry 2 of the performance test record.
7. Subtract the results of step 6 from the results of step 3. Record this value in TR Entry 3 of the performance test record.

The result should be less than 2.0 dB.

The absolute values in steps 3 and 6 should be less than 1.5 dB.

12. Frequency Response

Table 1-14. Frequency Response Errors Worksheet

Column 1 Frequency (MHz)	Column 2 Error Relative to 300 MHz (dB)	Column 3 Sensor CAL FACTOR Frequency (GHz)	Column 4 System Error (dB)	Column 5 (Option 001) Corrected Error Relative to 300 MHz (dB)
50		0.03		
100		0.1		
150		0.1		
200		0.3		
250		0.3		
300 (Ref)		0.3		
350		0.3		
400		0.3		
450		0.3		
500		0.3		
550		1.0		
600		1.0		
650		1.0		
700		1.0		
750		1.0		
800		1.0		
850		1.0		
900		1.0		
950		1.0		
1000		1.0		
1050		1.0		
1100		1.0		
1150		1.0		
1200		1.0		
1250		1.0		
1300		1.0		
1350		1.0		

12. Frequency Response

Table 1-14. Frequency Response Errors Worksheet (continued)

Column 1 Frequency (MHz)	Column 2 Error Relative to 300 MHz (dB)	Column 3 Sensor CAL FACTOR Frequency (GHz)	Column 4 System Error (dB)	Column 5 (Option 001) Corrected Error Relative to 300 MHz (dB)
1400		1.0		
1450		1.0		
1500		1.0		
1550		2.0		
1600		2.0		
1650		2.0		
1700		2.0		
1750		2.0		
1800		2.0		

Table 1-15. Frequency Response (<50 MHz) Worksheet

Column 1 Frequency	Column 2 Synthesizer/Level Generator Amplitude (dBm)	Column 3 Response Relative to 50 MHz	Column 4 Response Relative to 300 MHz
50 MHz		0 (Reference)	
20 MHz			
10 MHz			
5 MHz			
1 MHz			
200 kHz			
50 kHz			
9 kHz			

13. Other Input Related Spurious Responses

A synthesized source and the spectrum analyzer are set to the same frequency and the amplitude of the source is set to -10 dBm. A marker-amplitude reference is set on the analyzer. The source is then tuned to several different frequencies which should generate image responses. At each source frequency, the source amplitude is set to -10 dBm and the amplitude of the response, if any, is measured using the spectrum analyzer marker function. The marker-amplitude difference is then compared to the specification.

There are no related adjustment procedures for this performance test.

Equipment Required

- Synthesized sweeper
- Measuring receiver (used as a power meter)
- Power sensor
- Adapter, Type N (f) to APC 3.5 (f)
- Adapter, Type N (f) to Type N (f)
- Cable, Type N, 183 cm (72 in)

Additional Equipment for Option 001

- Power sensor
- Adapter, minimum loss
- Adapter, Type N (f) to BNC (m), $75\ \Omega$
- Adapter, Type N (f) to Type N (f)

13. Other Input Related Spurious Responses

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

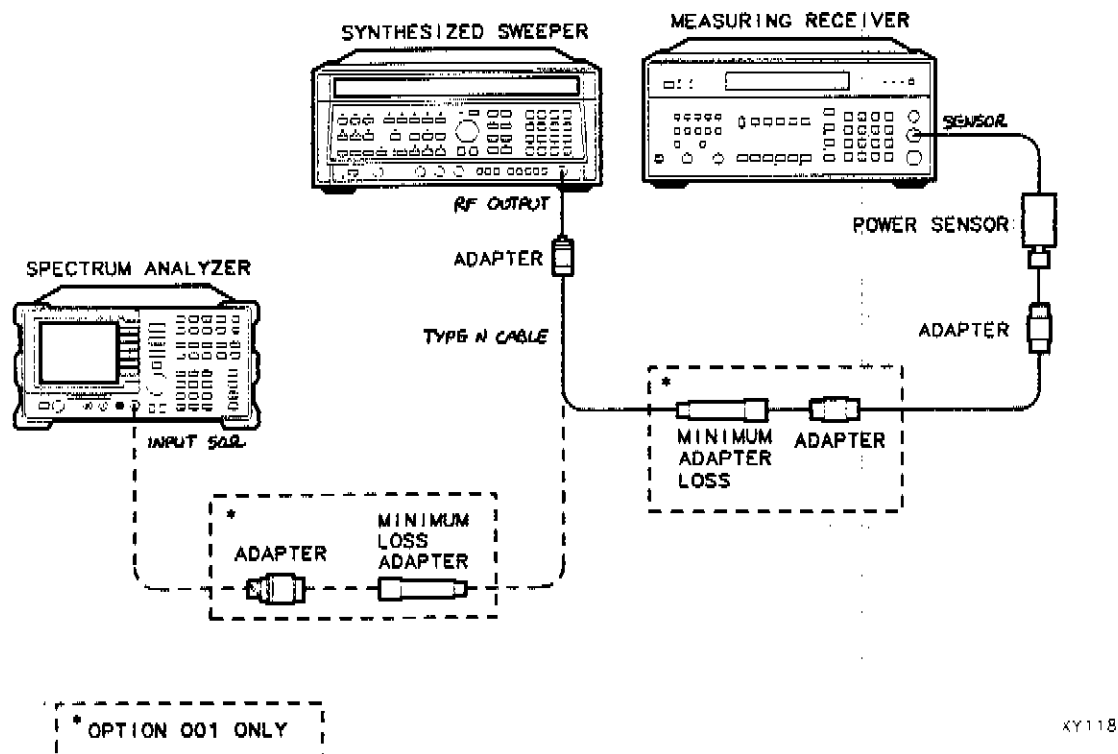


Figure 1-18. Other Input Related Spurious Test Setup

Procedure

1. Zero and calibrate the measuring receiver and the power sensor in log mode so that power is read out in dBm. Enter the power sensor's 542.8 MHz Cal Factor into the measuring receiver.
Option 001 only: Use 75 Ω power sensor.
2. Press INSTRUMENT PRESET on the synthesized sweeper and set the controls as follows:

CW	542.8 MHz
POWER LEVEL	-10 dBm
<i>Option 001 only:</i> POWER LEVEL	-14.3 dBm
3. Connect the equipment as shown in Figure 1-18. Connect the output of the synthesizer to the power sensor using adapters.
Option 001 only: Use the minimum loss adapter and 75 Ω adapter to connect to the 75 Ω power sensor.
4. Adjust the synthesized sweeper power level for a -10 dBm ± 0.1 dB reading on the measuring receiver.
5. On the synthesized sweeper, press SAVE 1.
6. Enter the power sensor's Cal Factor for 1142.8 MHz into the measuring receiver.
7. Set the CW frequency on the synthesized sweeper to 1142.8 MHz.

13. Other Input Related Spurious Responses

8. Adjust the synthesized sweeper power level for a $-10 \text{ dBm} \pm 0.1 \text{ dB}$ reading on the measuring receiver.
9. On the synthesized sweeper, press SAVE 2.
10. Enter the power sensor's Cal Factor for 500 MHz into the measuring receiver.
11. Set the CW frequency on the synthesized sweeper to 500 MHz.
12. Adjust the synthesized sweeper power level for a $-10 \text{ dBm} \pm 0.1 \text{ dB}$ reading on the measuring receiver.
13. Connect the synthesized sweeper to the RF INPUT of the spectrum analyzer using the appropriate cable and adapters.

Option 001 only: Use the minimum loss adapter and 75 Ω adapter as shown in Figure 1-18.

14. On the spectrum analyzer, press **PRESET** and wait for the preset to finish then set the controls as follows:

FREQUENCY 500 **(MHz)**
SPAN 10 **(MHz)**
AMPLITUDE 0 **(-dBm)**

Option 001 only: Press **AMPLITUDE**, More 1 of 2, Amptd Units, then dBm.

15. On the spectrum analyzer, press the following keys:

PEAK SEARCH
MKR FCTN MK TRACK ON OFF (ON)
SPAN 200 **(kHz)**

Wait for the AUTO ZOOM message to disappear. Press the following spectrum analyzer keys:

PEAK SEARCH
MKR -> MARKER -> REF LVL
MKR FCTN MK TRACK ON OFF (OFF)
PEAK SEARCH MARKER Δ
AMPLITUDE **(↓)** (step-down key).
SGL SWP

16. For each of the frequencies listed in Table 1-16, do the following:

- a. Set the synthesized sweeper to the listed CW frequency by pressing RECALL 1 for a CW frequency of 542.8 MHz or RECALL 2 for a CW frequency of 1148.8 MHz.
- b. Press **SGL SWP** and wait for the completion of a new sweep.
- c. On the spectrum analyzer, press **PEAK SEARCH** and record the marker-delta amplitude reading in Table 1-16 as the Actual MKR Δ Amplitude.

The Actual MKR Δ Amplitude should be less than the Maximum MKR Δ Amplitude listed in the table below.

The Maximum MKR Δ Amplitude is 10 dB more positive than the specification. This is due to the 10 dB change in reference level made in step 15.

13. Other Input Related Spurious Responses

Table 1-16. Image Responses Worksheet

Synthesized Sweeper CW Frequency	Actual MKR Δ Amplitude (dBc)	Maximum MKR Δ Amplitude (dBc)
542.8 MHz		-55
1142.8 MHz		-55

17. Record the Maximum MKR Δ Amplitude from Table 1-16 as TR Entry 1 in the performance test record.

14. Spurious Response

This test is performed in two parts. The first part measures second-harmonic distortion; the second part measures third-order intermodulation distortion.

To test second harmonic distortion, a 50 MHz low-pass filter is used to filter the source output, ensuring that harmonics read by the spectrum analyzer are internally generated and not coming from the source. To measure the distortion products, the power at the mixer is set 25 dB higher than specified. New test limits have been developed based on this higher power.

With -45 dBm at the input mixer and the distortion products suppressed by 70 dBc, the equivalent Second Order Intercept (SOI) is $+25$ dBm (-45 dBm + 70 dBc). Therefore, with -20 dBm at the mixer, and the distortion products suppressed by 45 dBc, the equivalent SOI is also $+25$ dBm (-20 dBm + 45 dBc).

For third order intermodulation distortion, two signals are combined in a directional bridge (for isolation) and are applied to the spectrum analyzer input. The power level of the two signals is 8 dB higher than specified, so the distortion products should be suppressed by 16 dB less than specified. In this manner, the equivalent Third Order Intercept (TOI) is measured.

With two -30 dBm signals at the input mixer and the distortion products suppressed by 70 dBc, the equivalent TOI is $+5$ dBm (-30 dBm + 70 dBc/2). However, if two -22 dBm signals are present at the input mixer and the distortion products are suppressed by 54 dBc, the equivalent TOI is also $+5$ dBm (-22 dBm + 54 dBc/2).

Performing the test with a higher power level maintains the measurement integrity while reducing both test time and the dependency upon the source's noise sideband performance.

There are no related adjustment procedures for this performance test.

It is only necessary to perform "Part 1: Second Harmonic Distortion, 30 MHz" for operation verification.

Equipment Required

- Synthesizer/level generator
- Synthesized sweeper
- Measuring receiver (used as a power meter)
- Power sensor, 100 kHz to 1800 MHz
- Low pass filter, 50 MHz
- Directional bridge
- Adapter, Type N (f) to APC 3.5 (f)
- Adapter, Type N (f) to BNC (m)
- Adapter, Type N (m) to BNC (f)
- Adapter, Type N (m) to BNC (m)
- Cable, BNC, 120 cm (48 in) (2 required)

Additional Equipment for Option 001

- Power sensor
- Adapter, mechanical, 75 Ω to 50 Ω
- Adapter, minimum loss
- Adapter, Type N (f) to BNC (m), 75 Ω
- Adapter, BNC (m) to BNC (m)

14. Spurious Response

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

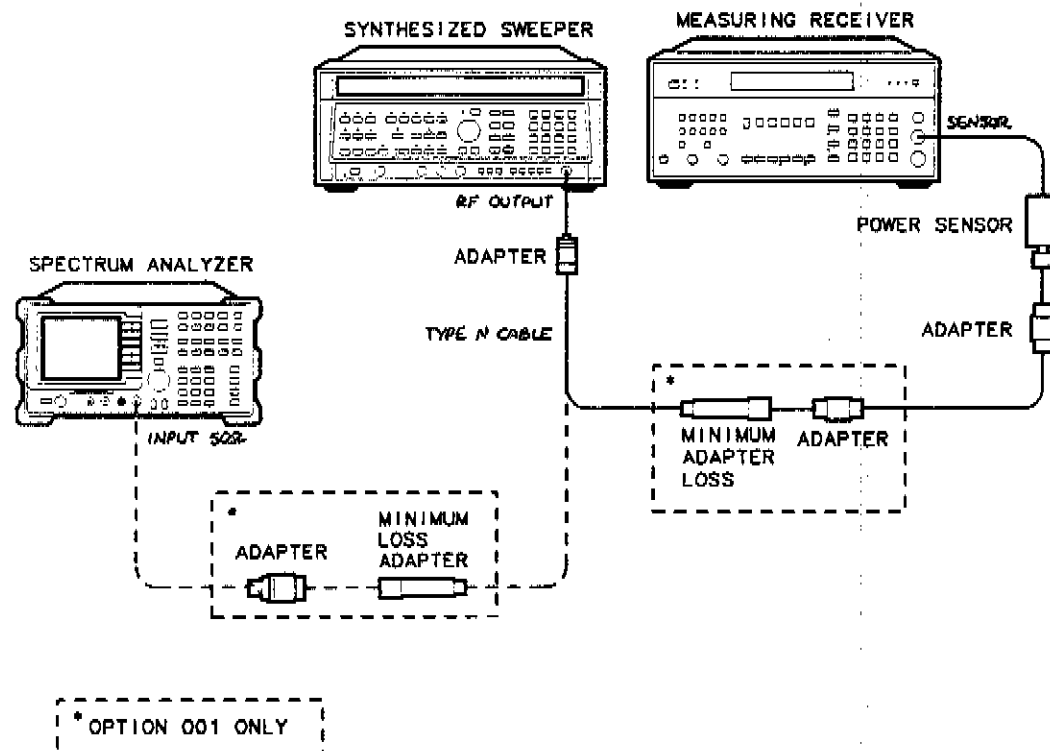


Figure 1-19. Second Harmonic Distortion Test Setup, 30 MHz

Procedure

Part 1: Second Harmonic Distortion, 30 MHz

1. Set the synthesizer/level generator controls as follows:

FREQUENCY	30 MHz
AMPLITUDE	-10 dBm
AMPLITUDE (Option 001)	-4.3 dBm

2. Connect the equipment as shown in Figure 1-19.

Option 001 only: Connect the minimum loss adapter between the LPF and INPUT 75 Ω .

14. Spurious Response

3. Press **PRESET** on the spectrum analyzer and wait for the preset to finish then set the controls as follows:

FREQUENCY 30 **MHz**
SPAN 10 **MHz**

Option 001 only: Press **AMPLITUDE**, More 1 of 2, Amptd Units, then dBm.

AMPLITUDE 10 **-dBm**
PEAK SEARCH
MKR FCTN MK TRACK ON OFF (ON)
SPAN 1 **MHz**
MKR FCTN MK TRACK ON OFF (OFF)
BW 30 **kHz**

4. Adjust the synthesizer/level generator Amplitude to place the peak of the signal at the reference level (-10 dBm).

5. Set the spectrum analyzer controls as follows:

BW 10 **kHz**
VID BW AUTO MAN 300 **Hz**

6. Wait for two sweeps to finish, then press the spectrum analyzer keys as follows:

PEAK SEARCH **MARKER** **Δ**
FREQUENCY
CF STEP AUTO MAN 30 **MHz**
FREQUENCY

7. Press **↑** (step-up key) on the spectrum analyzer to step to the second harmonic at 60 MHz. Press **PEAK SEARCH**. Record the MKR **Δ** Amplitude reading as TR Entry 1 in the performance test record.

14. Spurious Response

Part 2: Third Order Intermodulation Distortion, 50 MHz

Perform this procedure for calibrating the spectrum analyzer. It is not necessary to perform this procedure for operation verification.

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

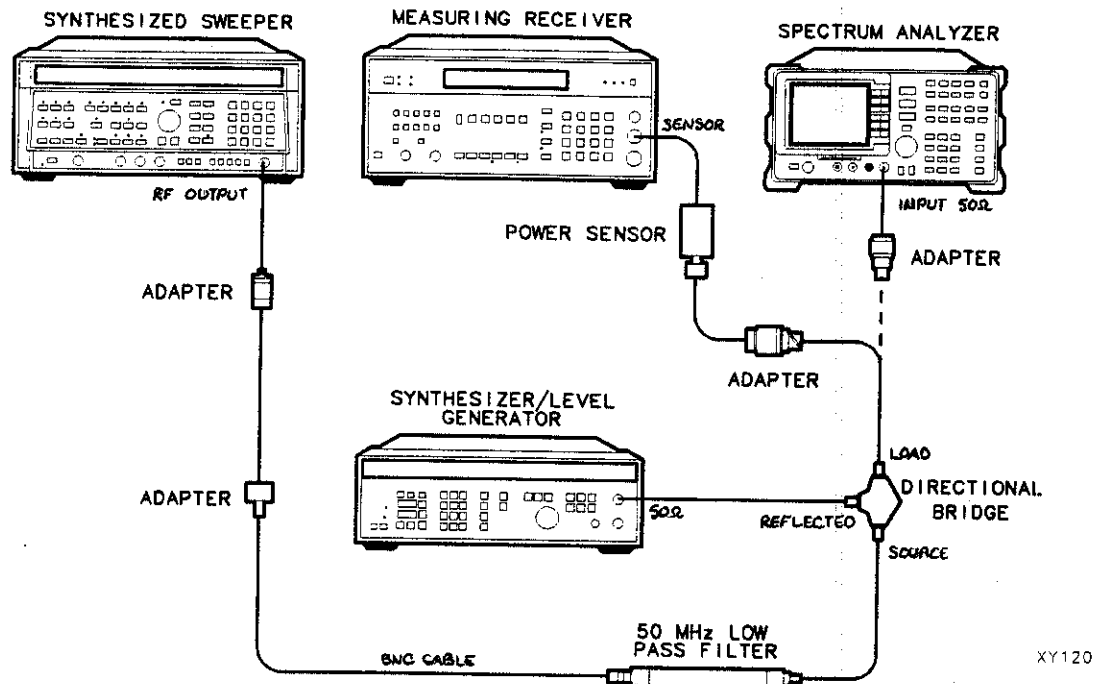


Figure 1-20. Third Order Intermodulation Distortion Test Setup

1. Zero and calibrate the measuring receiver and the power sensor in log mode so the power reads out in dBm. Enter the power sensor's 50 MHz Cal Factor into the measuring receiver.
Option 001 only: Calibrate the 75 Ω power sensor.

2. Connect the equipment as shown in Figure 1-20 with the output of the directional bridge connected to the power sensor.

Option 001 only: The power measured at the output of the 50 Ω directional bridge by the 75 Ω power sensor, is the equivalent power "seen" by the 75 Ω spectrum analyzer. Use the 75 Ω power sensor with the Type N (f) to BNC (m) 75 Ω adapter and use a BNC (m) to BNC (m) 75 Ω adapter in place of the 50 Ω adapter.

3. Press INSTRUMENT PRESET on the synthesized sweeper then set the controls as follows:

POWER LEVEL	-6 dBm
CW	50 MHz
RF	OFF

4. Set the synthesizer/level generator controls as follows:

FREQUENCY	50.050 MHz
AMPLITUDE	-6 dBm
50 Ω /75 Ω switch	75 Ω (no RF output)

14. Spurious Response

5. On the spectrum analyzer, press **PRESET** and wait until the preset is finished then set the controls as follows:

FREQUENCY 50 **MHz**
SPAN 10 **MHz**

Option 001 only: Press **AMPLITUDE**, More 1 of 2, Amptd Units, then dBm.

AMPLITUDE 10 **-dBm**
PEAK SEARCH More 1 of 2

PEAK EXCURSN 3 **dB**

DISPLAY More 1 of 2

THRESHLD ON OFF (ON) 90 **-dBm**

6. On the synthesized sweeper, set the RF to ON. Adjust the power level until the measuring receiver reads $-12 \text{ dBm} \pm 0.05 \text{ dB}$.
7. Disconnect the power sensor from the directional bridge. Connect the directional bridge directly to the spectrum analyzer RF INPUT using an adapter and *not* a cable.

Option 001 only: Use a 75 Ω adapter, BNC (m) to BNC (m).

8. On the spectrum analyzer, press the following keys:

PEAK SEARCH
MKR FCTN MK TRACK ON OFF (ON)
SPAN 200 **kHz**

Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

MKR FCTN MK TRACK ON OFF (OFF)
PEAK SEARCH
MKR -> MARKER ->REF LVL

9. On the synthesizer/level generator, set the 50 Ω /75 Ω switch to the 50 Ω position (RF ON). Adjust the Amplitude until the two signals are displayed at the same amplitude.
10. If necessary, adjust the spectrum analyzer center frequency until the two signals are centered on the display. Set the controls as follows:
- BW** 1 **kHz**
VID BW AUTO MAN 100 **Hz**
11. Press **PEAK SEARCH**, **DISPLAY**, then **DSP LINE ON OFF (ON)**. Set the display line to a value 54 dB below the current reference level setting.
12. The third order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line.

14. Spurious Response

13. If the distortion products can be seen, proceed as follows:
 - a. On the spectrum analyzer, press **(SGL SWP)**, wait for completion of the sweep, then press **(PEAK SEARCH)** and **MARKER Δ**.
 - b. Repeatedly press **NEXT PEAK** until the active marker is on the highest distortion product.
 - c. Record the MKR Δ amplitude reading as TR Entry 2 in the performance test record. The MKR Δ reading should be less than -54 dBc.
14. If the distortion products cannot be seen, proceed as follows:
 - a. On both the synthesized sweeper and the synthesizer/level generator, increase the power level by 5 dB. Distortion products should now be visible at this higher power level.
 - b. On the spectrum analyzer, press **(SGL SWP)**, **(PEAK SEARCH)**, then **MARKER Δ**.
 - c. Repeatedly press **NEXT PEAK** until the active marker is on the highest distortion products.
 - d. On both the synthesized sweeper and the synthesizer/level generator, reduce the power level by 5 dB and wait for the completion of a new sweep.
 - e. Record the MKR Δ amplitude reading as TR Entry 2 in the performance test record. The MKR Δ reading should be less than -54 dBc.

15. Gain Compression

Gain Compression is measured by applying two signals, separated by 3 MHz. First, the test places a -30 dBm signal at the input of the spectrum analyzer (the spectrum analyzer reference level is also set to -30 dBm). Then, a 0 dBm signal is applied to the spectrum analyzer, overdriving its input. The decrease in the first signal's amplitude (gain compression) caused by the second signal is the measured gain compression.

There are no related adjustment procedures for this performance test.

Equipment Required

- Synthesized sweeper
- Synthesizer/level generator
- Measuring receiver (used as a power meter)
- Power sensor
- Directional bridge
- Adapter, Type N (f) to BNC (m)
- Adapter, Type N (m) to BNC (m)
- Adapter, Type N (f) to APC 3.5 (f)
- Adapter, Type N (m) to BNC (f)
- Cable, BNC, 120 cm (48 in) (2 required)

Additional Equipment for Option 001

- Power sensor, 75 Ω
- Adapter, Type N (f) to BNC (m), 75 Ω
- Adapter, BNC (m) to BNC (m), 75 Ω

15. Gain Compression

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.

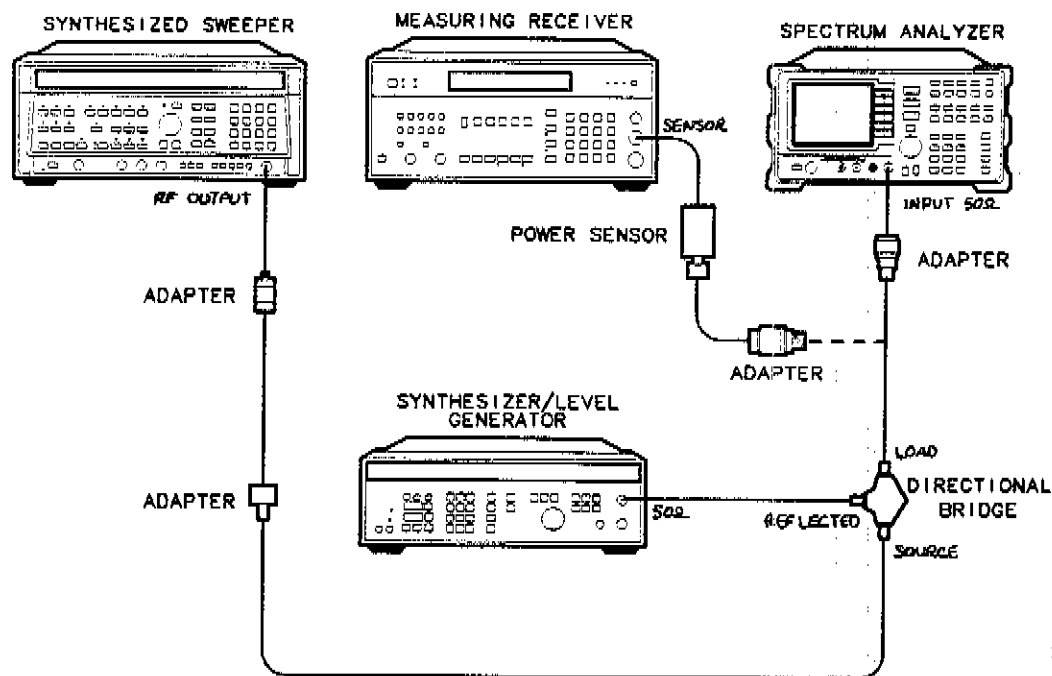


Figure 1-21. Gain Compression Test Setup

Procedure

1. Zero and calibrate the measuring receiver and the power sensor in log mode so the power reads out in dBm. Enter the power sensor's 50 MHz Cal Factor into the measuring receiver.

Option 001 only: Calibrate the 75 Ω power sensor.

2. Connect the equipment as shown in Figure 1-21, with the load (reflected) of the directional coupler connected to the power sensor.

Option 001 only: The power measured at the output of the 50 Ω directional bridge by the 75 Ω power sensor, is the equivalent power "seen" by the 75 Ω spectrum analyzer. Use the 75 Ω power sensor with a Type N (f) to BNC (m) 75 Ω adapter and use a BNC (m) to BNC (m) 75 Ω adapter in place of the 50 Ω adapter.

3. Press INSTRUMENT PRESET on the synthesized sweeper then set the controls as follows:

CW 53 MHz
POWER LEVEL 6 dBm

4. Set the synthesizer/level generator controls as follows:

CW 50 MHz
AMPLITUDE -14 dBm
50 Ω /75 Ω SWITCH 75 Ω (no RF output)

15. Gain Compression

5. On the spectrum analyzer, press **PRESET** and wait for the preset to finish then set the controls as follows:

FREQUENCY 50 **MHz**
SPAN 20 **MHz**

Option 001: Press **AMPLITUDE**, More 1 of 2, Amptd Units, then dBm.

AMPLITUDE 20 **-dBm**
SCALE LOG LIN (LOG) 1 **dB**
BW 300 **kHz**

6. On the synthesized sweeper, adjust the power level for a 0 dBm reading on the measuring receiver. Set RF to OFF. On the synthesizer/level generator, set the 50 Ω /75 Ω switch to 50 Ω .

Note that the power level applied to the spectrum analyzer input is 10 dB greater than the specification to account for the 10 dB attenuation setting. A power level of 0 dBm at the spectrum analyzer input yields -10 dBm at the input mixer.

7. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50 Ω connector of the spectrum analyzer using an adapter and *not* a cable.

Option 001 only: Use a 75 Ω adapter, BNC (m) to BNC (m).

8. On the spectrum analyzer, press the following keys:

PEAK SEARCH
MKR FCTN MK TRACK ON OFF (ON)
SPAN 10 **MHz**

Wait for the AUTO ZOOM message to disappear.

9. On the synthesizer/level generator, adjust the Amplitude to place the signal 1 dB below the spectrum analyzer reference level.
10. On the spectrum analyzer, press **SGL SWP**, **PEAK SEARCH**, then **MARKER Δ** .
11. On the synthesized sweeper, set RF to ON.
12. On the spectrum analyzer, press **SGL SWP**, **PEAK SEARCH**, **NEXT PEAK**. The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the spectrum analyzer knob.
13. Read the MKR Δ amplitude and record as TR Entry 1 in the performance test record. The absolute value of this amplitude should be less than or equal to 0.5 dB.

16. Displayed Average Noise Level

This test measures the displayed average noise level within the frequency range specified. The spectrum analyzer input is terminated in $50\ \Omega$.

The LO feedthrough is used as a frequency reference for these measurements. The test tunes the spectrum analyzer frequency

across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing **PRESET**.

The related adjustment for this procedure is the "Frequency Response Adjustment."

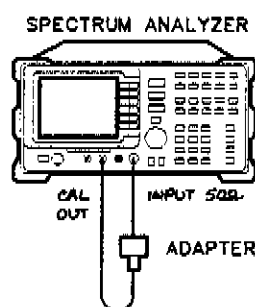
Equipment Required

- Termination, $50\ \Omega$
- Adapter, Type N (m) to BNC (f)
- Cable, BNC, 23 cm (9 in)

Additional Equipment for Option 001

- Termination, $75\ \Omega$ Type N (m)
- Adapter, $75\ \Omega$, Type N (f) to BNC (m)
- Cable, BNC, $75\ \Omega$, 30 cm (12 in)

Caution Use only $75\ \Omega$ cables, connectors, or adapters on the $75\ \Omega$ input of an Option 001 or damage to the input connector will occur.



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Figure 1-22. Displayed Average Noise Level Test Setup

16. Displayed Average Noise Level

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50 Ω of the spectrum analyzer as shown in Figure 1-22.

Option 001 only: Use a 75 Ω cable and omit the adapter.

Press **[PRESET]** and wait for the preset to finish. Set the controls as follows:

[FREQUENCY] 300 **[MHz]**
[SPAN] 10 **[MHz]**
[AMPLITUDE] 20 **[dBm]**

Option 001 only: **[AMPLITUDE]** REF LVL 28.75 **[dBm]**

ATTEN AUTO MAN 0 **[dB]**

2. Press the following spectrum analyzer keys:

[PEAK SEARCH]
[MKR FCTN] MK TRACK ON OFF (ON)
[SPAN] 100 **[kHz]**

Wait for the AUTO ZOOM message to disappear. Set the controls as follows:

[BW]
VID BW AUTO MAN 30 **[Hz]**
[MKR FCTN] MK TRACK ON OFF (OFF)

3. Press **[SGL SWP]** and wait for completion of a new sweep, then press the following spectrum analyzer keys:

[PEAK SEARCH]
[AMPLITUDE] More 1 of 3
REF LVL OFFSET

Subtract the MKR amplitude reading from -20 dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads -20.21 dBm, enter +0.21 dB (-20 dBm - (-20.21 dBm) = +0.21 dB). *Example for Option 001:* If the marker reads 26.4 dBmV, enter +2.35 dBmV (28.75 dBmV - 26.4 dBmV = 2.35 dBmV).

REF LVL OFFSET _____ dB

Option 001: REF LVL OFFSET _____ dBmV

4. Disconnect the cable from the INPUT 50 Ω connector of the spectrum analyzer. Connect the 50 Ω termination to the spectrum analyzer INPUT 50 Ω connector.

Option 001 only: Use the 75 Ω termination.

16. Displayed Average Noise Level

400 kHz

If testing a spectrum analyzer equipped with Option 001, omit steps 5 through 9 and proceed to step 10.

5. Press the following spectrum analyzer keys:

AUTO COUPLE
VID BW AUTO MAN (AUTO)
FREQUENCY 0 **Hz**
SPAN 10 **MHz**
AMPLITUDE 10 **-dBm**
TRIG SWEEP CONT SGL

6. Press the following spectrum analyzer keys:

PEAK SEARCH
MKR FCTN MK TRACK ON OFF (ON)
SPAN 800 **kHz**

Wait for the AUTO ZOOM message to disappear, then press the following spectrum analyzer keys:

MKR FCTN MK TRACK ON OFF (OFF)
BW 3 **kHz**
FREQUENCY

7. Adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the controls as follows:

SPAN 0 **Hz**
AMPLITUDE 50 **-dBm**
BW 1 **kHz**
VID BW AUTO MAN 30 **Hz**
SWEEP SWP TIME AUTO MAN 5 **sec**

Press **TRACE**, More 1 of 3, DETECTOR SMP PK (SMP), then **SGL SWP**.

Wait for completion of a new sweep.

8. Press the following spectrum analyzer keys:

DISPLAY
DSP LINE ON OFF (ON)

Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Refer to the Residual Responses verification test for any suspect residuals.

9. Record the display line amplitude setting as TR Entry 1 as the noise level at 400 kHz. The average noise level should be less than the specified limit.

16. Displayed Average Noise Level

1 MHz

10. Press the following spectrum analyzer keys:

AUTO COUPLE

RES BW AUTO MAN (AUTO)

VID BW AUTO MAN (AUTO)

FREQUENCY 0 **Hz**

SPAN 10 **MHz**

AMPLITUDE 10 **-dBm**

Option 001 only: **AMPLITUDE** REF LVL 35 **-dBm**

TRIG SWEEP CONT SGL (CONT)

11. Press the following spectrum analyzer keys:

PEAK SEARCH

MKR FCTN MK TRACK ON OFF (ON)

MKR -> MARKER ->REF LVL

SPAN 2 **MHz**

Wait for the AUTO ZOOM message to disappear. Press **MKR FCTN** then MK TRACK ON OFF (OFF).

12. Press **FREQUENCY** and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the controls as follows:

SPAN 50 **kHz**

AMPLITUDE 50 **-dBm**

Option 001 only: **AMPLITUDE** REF LVL 1.2 **-dBm**

BW

VID BW AUTO MAN 30 **Hz**

13. Press **SGL SWP**. Wait for the completion of a new sweep.

14. Press the following spectrum analyzer keys:

DISPLAY

DSP LINE ON OFF (ON)

Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Refer to the Residual Responses verification test for any suspect residuals.

15. Record the display line amplitude setting as TR Entry 2 in the performance test record as the noise level at 1 MHz. The average noise level should be less than the specified limit.

16. Displayed Average Noise Level

1 MHz to 1.5 GHz

16. Press the following spectrum analyzer keys:

FREQUENCY
START FREQ 1 **MHz**
STOP FREQ 1.5 **GHz**
BW 1 **MHz**
VID BW AUTO MAN 10 **kHz**
TRIG SWEEP CONT SGL (CONT)

17. Adjust the spectrum analyzer start frequency setting, if necessary, to place the LO feedthrough just off-screen to the left.

18. Press the following spectrum analyzer keys:

SGL SWP
TRACE CLEAR WRITE A More 1 of 3
VID AVG ON OFF (ON) 10 **Hz**

Wait until AVG 10 is displayed to the left of the graticule (the spectrum analyzer will take ten sweeps, then stop).

19. Press **PEAK SEARCH** and record the MKR frequency as the Measurement Frequency in Table 1-17 for 1 MHz to 1.5 GHz.

20. Press the following spectrum analyzer keys:

TRACE More 1 of 3 VID AVG ON OFF (OFF)
AUTO COUPLE RES BW AUTO MAN (AUTO)
VID BW AUTO MAN (AUTO)
SPAN 50 **kHz**
FREQUENCY CENTER FREQ

Set the center frequency to the measurement frequency recorded in Table 1-17 for 1 MHz to 1.5 GHz. Set the controls as follows:

BW 1 **kHz**
VID BW AUTO MAN 30 **Hz**

21. Press **SGL SWP**.

Wait for the sweep to finish. Press the following spectrum analyzer keys:

DISPLAY
DSP LINE ON OFF (ON)

Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Refer to the Residual Responses verification test for any suspect residuals.

22. Record the display line amplitude setting as TR Entry 3 in the performance test record. The average noise level should be less than the specified limit.

16. Displayed Average Noise Level

1.5 GHz to 1.8 GHz

23. Press the following spectrum analyzer keys:

AUTO COUPLE

RES BW AUTO MAN (AUTO)

VID BW AUTO MAN (AUTO)

SPAN 10 **MHz**

AMPLITUDE 50 **-dBm**

Option 001 only: **AMPLITUDE** REF LVL 1.2 **-dBm**

TRIG SWEEP CONT SGL (CONT)

FREQUENCY

START FREQ 1.5 **GHz**

STOP FREQ 1.8 **GHz**

24. Repeat steps 18 through 21 above for frequencies from 1.5 GHz to 1.8 GHz.

If the Displayed Average Noise at 1.8 GHz is at or out of specification, it is recommended that a known frequency source be used as a frequency marker. This ensures that testing is done at or below 1.8 GHz.

Table 1-17. Displayed Average Noise Level

Frequency Range	Measurement Frequency	Displayed Average Noise Level (dBm or dBmV) TR Entry	Specification
400 kHz	400 kHz	1	-115 dBm
1 MHz	1 MHz	2	-115 dBm (Option 001: ≤ -63 dBmV)
1 MHz to 1.5 GHz	_____	3	-115 dBm (Option 001: ≤ -63 dBmV)
1.5 GHz to 1.8 GHz	_____	4	-113 dBm (Option 001: ≤ -61 dBmV)

25. Record the display line amplitude setting as TR Entry 4 in the performance test record. The average noise level should be less than the specified limit.

17. Residual Responses

The spectrum analyzer input is terminated and the spectrum analyzer is swept from 150 kHz above the LO to 1 MHz. Then the spectrum analyzer is swept in 50 MHz spans throughout the 1 MHz to 1.8 GHz range. Any responses above the specification are noted.

There are no related adjustment procedures for this performance test.

Equipment Required

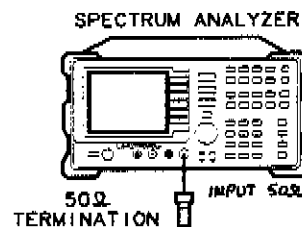
Termination, 50 Ω

Additional Equipment for Option 001

Termination, 75 Ω Type N (m)

Adapter, 75 Ω Type N (f) to BNC (m)

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 001 or damage to the input connector will occur.



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Figure 1-23. Residual Response Test Setup

Procedure

150 kHz to 1 MHz

1. Connect the termination to the spectrum analyzer input as shown in Figure 1-23.

Option 001 only: Use the 75 Ω termination with the adapter, skip steps 2 through 4, and proceed with step 5.

2. Press **PRESET** on the spectrum analyzer and wait for the preset to finish. Press the following spectrum analyzer keys:

PEAK SEARCH

MKR FCTN **MK TRACK ON OFF (ON)**

SPAN **1** **MHz**

Wait for the AUTO ZOOM message to disappear, then press **MKR FCTN** and **MK TRACK ON OFF (OFF)**.

17. Residual Responses

3. Adjust the center frequency until the LO feedthrough peak is on the left-most vertical graticule line. Press the following spectrum analyzer keys as follows:

PEAK SEARCH
MKR
MARKER Δ 150 (kHz)
MARKER NORMAL
AMPLITUDE 60 (-dBm)
ATTEN AUTO MAN 0 (dB)
BW 3 (kHz)
VID BW AUTO MAN 1 (kHz)
DISPLAY
DSP LINE ON OFF 90 (-dBm)

4. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line. If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 1-18.

1 MHz to 1.8 GHz

5. Press (PRESET) on the spectrum analyzer and wait for the preset to finish. Set the controls as follows:

FREQUENCY 25 (MHz)
SPAN 50 (MHz)
AMPLITUDE 60 (-dBm)
Option 001 only: AMPLITUDE REF LVL 11.25 (-dBm)
ATTEN AUTO MAN 0 (dB)

6. Press (FREQUENCY) and adjust the center frequency until the LO feedthrough (the "signal" near the left of the screen) is just off the left-most vertical graticule line. Set the controls as follows:

CF STEP AUTO MAN 45 (MHz)
BW 10 (kHz)
VID BW AUTO MAN 3 (kHz)
DISPLAY
DSP LINE ON OFF 90 (-dBm)

Option 001 only: Press (DISPLAY), DSP LINE ON OFF, then 38 (-dBm)

7. Press (SGL SWP) and wait for a new sweep to finish. Look for any residual responses at or above the display line. If a residual is suspected, press (SGL SWP) again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 1-18.

17. Residual Responses

8. Press **FREQUENCY**, **↑** (step-up key), to step to the next frequency and repeat step 7.
9. Repeat steps 7 and 8 until the range from 1 MHz to 1.8 GHz has been checked. This requires 40 additional frequency steps. The test for this band requires about 6 minute to complete if no residuals are found.

If there are any residuals at or near the frequency specification limits (1 MHz or 1.8 GHz), it is recommended that a known frequency source be used as a frequency marker. This will ensure that testing is done within the specification limits.

10. Record the highest residual from Table 1-18 as TR Entry 1 in the performance test record. If no residuals are found, then record N/A in the performance test record.

Table 1-18. Residual Responses Above Display Line

Frequency (MHz)	Amplitude (dBm)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

18. Absolute Amplitude, Vernier, and Power Sweep Accuracy

This procedure is only for spectrum analyzers equipped with Option 010 or 011.

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. A calibrated power sensor is then connected to the tracking generator output to measure the power level at 300 MHz.

The measuring receiver is then set for RATIO mode so that future power level readings are in dB relative to the power level at -10 dBm (Option 011: +38.8 dBmV). The output power level setting is decreased in 1 dB steps and the power level is measured at each step. The difference between ideal and actual power levels is calculated at each step.

Since a power sweep is accomplished by stepping through the vernier settings, the peak-to-peak variation of the vernier accuracy is equal to the power sweep accuracy.

The related adjustment for this procedure is the "Modulator Offset and Gain Adjustment."

Equipment Required

- Measuring receiver
- Power sensor
- Cable, Type N, 62 cm (24 in)

Additional Equipment for Option 011

- Power sensor
- Cable, BNC, 75 Ω
- Adapter, Type N (f) to BNC (m), 75 Ω
- Adapter, mechanical, Type N, 50 Ω (m) to 75 Ω (f)

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.

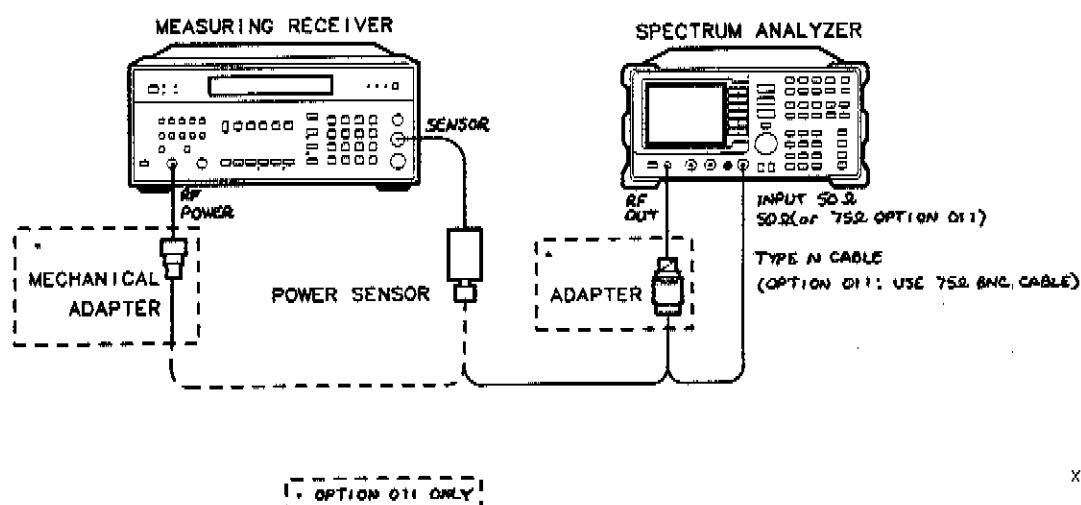


Figure 1-24. Absolute Amplitude, Vernier, and Power Sweep Accuracy Test Setup

18. Absolute Amplitude, Vernier, and Power Sweep Accuracy

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 1-24.
Option 011 only: Connect the BNC cable between the RF OUT 75 Ω and INPUT 75 Ω connectors on the spectrum analyzer.
2. Press **[PRESET]** on the spectrum analyzer and set the controls as follows:
[FREQUENCY] 300 **[MHz]**
[SPAN] 0 **[Hz]**
3. On the spectrum analyzer, press the following keys:
[MKR]
[AUX CTRL] Track Gen
SRC PWR ON OFF (ON) 5 **[dBm]**
Option 011 only: SRC PWR ON OFF (ON) 38 **[dBm]**
4. On the spectrum analyzer, press **TRACKING PEAK**. Wait for the **PEAKING** message to disappear.
5. Zero and calibrate the measuring receiver/power sensor combination in log mode (power levels readout in dBm). Enter the power sensor's 300 MHz Cal Factor into the measuring receiver.
6. Disconnect the Type N cable from the RF OUT 50 Ω and connect the power sensor to the RF OUT 50 Ω as shown in Figure 1-24.
Option 011 only: Disconnect the BNC cable from the RF OUT 75 Ω and connect the power sensor to the RF OUT 75 Ω using an adapter.
7. On the spectrum analyzer, press 10 **[dBm]**, **[SGL SWP]**.
Option 011 only: 38.8 **[dBm]** (+38.8 dBmV).
8. Subtract -10 dBm from the power level displayed on the measuring receiver and record the result in the performance test record as TR Entry 1.
9. Press **RATIO** on the measuring receiver. Power levels now readout in dB relative to the power level just measured at the -10 dBm output power level setting.
Option 011 only: +38.8 dBmV output power level setting.
10. Set the SRC POWER to the settings indicated in Table 1-19. At each setting, record the power level displayed on the measuring receiver.
11. Calculate the Vernier Accuracy by subtracting the SRC POWER setting and 10 dB from the Measured Power Level for each SRC POWER setting in Table 1-19.
$$\text{Vernier Accuracy} = \text{Measured Power Level} - \text{SRC POWER} + 10 \text{ dB}$$

Option 011 only: Calculate the Vernier Accuracy by subtracting the SRC POWER setting from the Measured Power Level, adding 38.8 dB to each SRC POWER setting in Table 1-19.
$$\text{Vernier Accuracy} = \text{Measured Power Level} - \text{SRC POWER} - 38.8 \text{ dB}$$
12. Locate the most positive and most negative Absolute Vernier Accuracy values in Table 1-19 and record as TR Entries 2 and 3 in the performance test record.

18. Absolute Amplitude, Vernier, and Power Sweep Accuracy

13. Calculate the power sweep accuracy by subtracting the Negative Vernier Accuracy recorded in step 12 from the Positive Vernier Accuracy recorded in step 12. Record the result in the performance test record as TR Entry 4.

$$\text{Power Sweep Accuracy} = \text{Positive Vernier Accuracy} - \text{Negative Vernier Accuracy}$$

Table 1-19. Vernier Accuracy Worksheet

SRC POWER Setting		Measured Power Level	Vernier Accuracy	Measurement Uncertainty
Opt 011, dBmV	Opt 010, dBm	(dB)	(dB)	(dB)
+38.8	-10	0 (Ref)	0 (Ref)	0
+39.8	-9			±0.033
+40.8	-8			±0.033
+41.8	-7			±0.033
+42.8	-6			±0.033
+37.8	-5			±0.033
+36.8	-4			±0.033
+35.8	-3			±0.033
+34.8	-2			±0.033
+33.8	-1			±0.033
+32.8	0			±0.033
+31.8	-15			±0.033
+30.8	-14			±0.033
+29.8	-13			±0.033
+28.8	-12			±0.033
+27.8	-11			±0.033

19. Tracking Generator Level Flatness

This procedure is only for spectrum analyzers equipped with Option 010 or 011.

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. A calibrated power sensor is then connected to the tracking generator output to measure the power level at 300 MHz. The measuring receiver is set for RATIO mode so that future power level readings are in dB relative to the power level at 300 MHz.

The tracking generator is stepped to several frequencies throughout its range. The output power difference relative to the power level at 300 MHz is measured at each frequency and recorded.

The related adjustment for this procedure is the "Modulator Offset and Gain Adjustment."

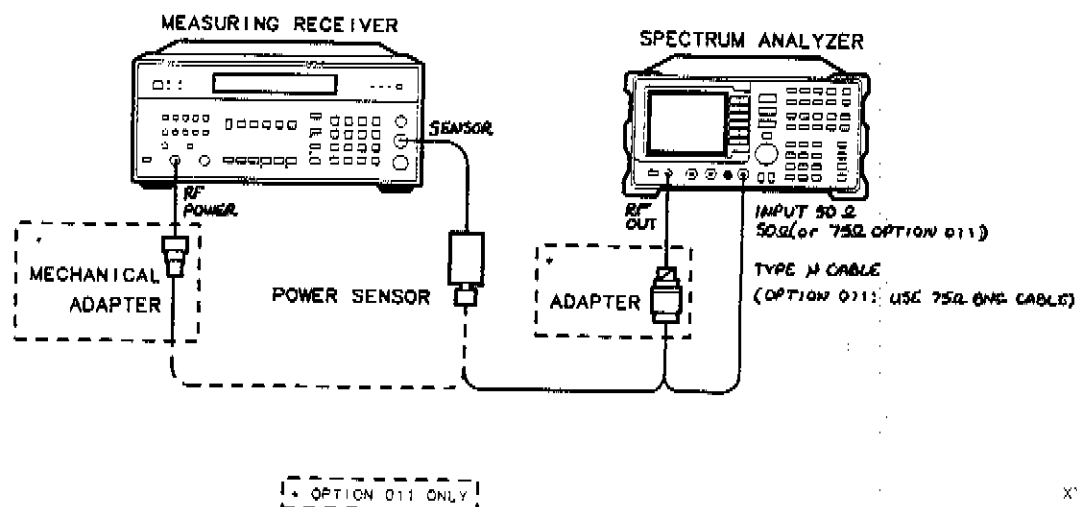
Equipment Required

Measuring receiver
Power sensor
Cable, Type N, 62 cm (24 in)

Additional Equipment for Option 011

Power sensor
Adapter, Type N (f) to BNC (m), 75 Ω
Adapter, mechanical, Type N, 50 Ω (m) to 75 Ω (f)
Cable, BNC, 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.



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Figure 1-25. Tracking Generator Level Flatness Test Setup

19. Tracking Generator Level Flatness

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 1-25.

Option 011 only: Connect the BNC cable between the RF OUT 75 Ω and INPUT 75 Ω connectors on the spectrum analyzer.

2. Press **[PRESET]** on the spectrum analyzer. Set the controls as follows:

[FREQUENCY] 0 **[Hz]**

[SPAN] 15 **[MHz]**

3. Press the following spectrum analyzer keys:

[PEAK SEARCH]

[MKR FCTN] MK TRACK ON OFF (ON)

[SPAN] 100 **[kHz]**

Wait for the AUTO ZOOM message to disappear. Press **[FREQUENCY]**, **FREQ OFFSET**. Enter the negative of the MKR-TRK frequency displayed in the upper right-hand corner of the display. For example, if the MKR-TRK frequency is 132 kHz, enter -132 kHz.

Set the spectrum analyzer controls as follows:

[MKR FCTN] MK TRACK ON OFF (OFF)

[SPAN] ZERO SPAN

[BW] 1 **[MHz]**

4. Set the spectrum analyzer controls as follows:

[FREQUENCY] 300 **[MHz]**

CF STEP AUTO MAN 100 **[MHz]**

[SPAN] 0 **[Hz]**

5. On the spectrum analyzer, press the following keys:

[MKR]

[AUX CTRL] Track Gen

SRC PWR ON OFF 5 **[dBm]**

Option 011 only: **SRC PWR** ON OFF 38 **[dBm]** (+38 dBmV).

6. On the spectrum analyzer, press **TRACKING PEAK**. Wait for the **PEAKING** message to disappear.
7. Zero and calibrate the measuring-receiver/power-sensor combination in log mode (power levels readout in dBm). Enter the power sensor's 300 MHz Cal Factor into the measuring receiver.
8. Disconnect the Type N cable from the RF OUT 50 Ω and connect the power sensor to the RF OUT 50 Ω .

Option 011 only: Disconnect the BNC cable from the RF OUT 75 Ω and connect the power sensor to the RF OUT 75 Ω using an adapter.

9. On the spectrum analyzer, press **[AUX CTRL]**, **Track Gen**, **SRC PWR** ON OFF, 10 **[dBm]**, then **[SGL SWP]**.

Option 011 only: **SRC PWR** ON OFF 38.8 **[dBm]**.

19. Tracking Generator Level Flatness

10. Press **RATIO** on the measuring receiver. The measuring receiver readout is now for power levels relative to the power level at 300 MHz.
11. Set the spectrum analyzer center frequency to 100 kHz then press **(SGL SWP)**.
Option 011 only: Set the spectrum analyzer center frequency to 1 MHz then press **(SGL SWP)**.
12. Enter the appropriate power sensor Cal Factor into the measuring receiver as indicated in Table 1-20.
13. Record the power level displayed on the measuring receiver as the Level Flatness in Table 1-20.
14. Repeat steps 11 through 13 above to measure the flatness at each center frequency setting listed in Table 1-20. The **(↑)** (step-up) key may be used to tune to center frequencies above 100 MHz.

Spectrum analyzers equipped with Option 011 should be tested only at frequencies of 1 MHz to 1.8 GHz.

15. Locate the most positive Level Flatness reading in Table 1-20 for the indicated frequency ranges and record as the Maximum Flatness.

Option 010:

Maximum Flatness, 100 kHz _____ dB (TR Entry 1)
Maximum Flatness, 300 kHz to 5 MHz _____ dB (TR Entry 2)
Maximum Flatness, 10 MHz to 1800 MHz _____ dB (TR Entry 3)

Option 011:

Maximum Flatness, 1 MHz to 1800 MHz _____ dB (TR Entry 1)

16. Locate the most negative Level Flatness reading in Table 1-20 for the indicated frequency ranges as the Minimum Flatness.

Option 010:

Minimum Flatness, 100 kHz _____ dB (TR Entry 4)
Minimum Flatness, 300 kHz to 5 MHz _____ dB (TR Entry 5)
Minimum Flatness, 10 MHz to 1800 MHz _____ dB (TR Entry 6)

Option 011:

Minimum Flatness, 1 MHz to 1800 MHz _____ dB (TR Entry 2)

17. Press **(PRESET)** on the spectrum analyzer.

19. Tracking Generator Level Flatness

Table 1-20. Level Flatness Relative to 300 MHz Worksheet

Center Freq	Level Flatness (dB)	Cal Factor Freq (MHz)	Measurement Uncertainty (dB)	
			Option 010	Option 011
100 kHz*		0.1	+0.42/-0.45	N/A
300 kHz*		0.3	+0.28/-0.28	N/A
500 kHz*		0.3	+0.28/-0.28	N/A
1 MHz		1	+0.28/-0.28	+0.18/-0.39
2 MHz		3	+0.28/-0.28	+0.18/-0.39
5 MHz		3	+0.28/-0.28	+0.18/-0.39
10 MHz		10	+0.24/-0.24	+0.18/-0.39
20 MHz		30	+0.24/-0.24	+0.18/-0.39
50 MHz		50	+0.24/-0.24	+0.18/-0.39
100 MHz		100	+0.24/-0.24	+0.18/-0.39
200 MHz		300	+0.24/-0.24	+0.18/-0.39
300 MHz	0 (Ref)	300	0 (Ref)	0 (Ref)
400 MHz		300	+0.24/-0.24	+0.18/-0.39
500 MHz		300	+0.24/-0.24	+0.18/-0.39
600 MHz		300	+0.24/-0.24	+0.18/-0.39
700 MHz		1000	+0.24/-0.24	+0.18/-0.39
800 MHz		1000	+0.24/-0.24	+0.18/-0.39
900 MHz		1000	+0.24/-0.24	+0.18/-0.39
1000 MHz		1000	+0.24/-0.24	+0.18/-0.39
1100 MHz		1000	+0.24/-0.24	+0.18/-0.39
1200 MHz		1000	+0.24/-0.24	+0.18/-0.39
1300 MHz		1000	+0.24/-0.24	+0.18/-0.39
1400 MHz		1000	+0.24/-0.24	+0.18/-0.39
1500 MHz		2000	+0.24/-0.24	+0.18/-0.39
1600 MHz		2000	+0.24/-0.24	+0.18/-0.39
1700 MHz		2000	+0.24/-0.24	+0.18/-0.39
1800 MHz		2000	+0.24/-0.24	+0.18/-0.39

* These frequencies are tested on Option 010 spectrum analyzers only.

20. Harmonic Spurious Outputs

This procedure is only for spectrum analyzers equipped with Option 010 or 011.

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is then connected to the input of an microwave spectrum analyzer. The tracking generator is tuned to several frequencies and the amplitude of the second and third harmonics relative to the fundamental are measured at each frequency.

There are no related adjustment procedures for this performance test.

Equipment Required

Microwave spectrum analyzer
 Adapter, Type N (m) to BNC (f)
 Cable, Type N, 62 cm (24 in)
 Cable, BNC, 23 cm (9 in)

Additional Equipment for Option 011

Adapter, minimum loss
 Adapter, Type N (f) to BNC (m), 75 Ω
 Cable, BNC, 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.

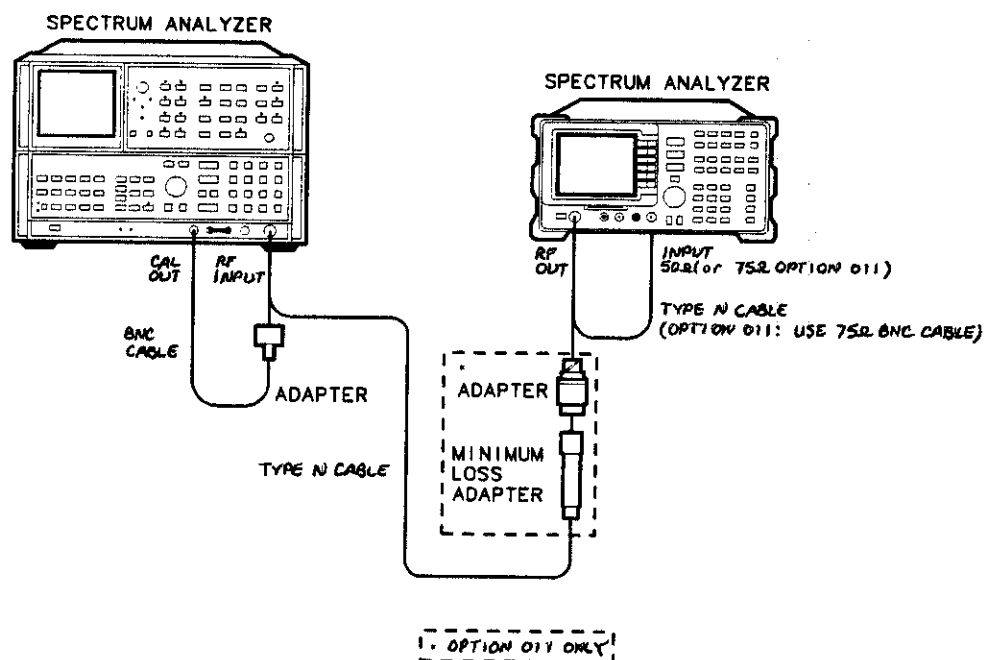


Figure 1-26. Harmonic Spurious Outputs Test Setup

20. Harmonic Spurious Outputs

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 1-26.
Option 011 only: Connect the 75 Ω BNC cable between the RF OUT 75 Ω and INPUT 75 Ω connectors on the spectrum analyzer.
2. Press PRESET on the spectrum analyzer and set the controls as follows:

FREQUENCY 300 **MHz**
SPAN 0 **Hz**

3. On the spectrum analyzer, press the following keys:

MKR
AUX CTRL Track Gen
SRC PWR ON OFF 5 **-dBm**

Option 011 only: SRC PWR ON OFF 42 **+dBm** (+42 dBmV).

4. On the spectrum analyzer, press TRACKING PEAK. Wait for the PEAKING message to disappear.
5. On the spectrum analyzer, press 0 **+dBm**, **FREQUENCY**, 10 **MHz**, then **SGL SWP**.

Option 011 only: 42.8 **+dBm**.

It is only necessary to perform step 6 if more than 2 hours have elapsed since a front-panel calibration of the microwave spectrum analyzer has been performed. The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

6. Perform a front-panel calibration of the microwave spectrum analyzer as follows:
 - a. Connect a BNC cable between CAL OUTPUT and RF INPUT.
 - b. Press **2 - 22 GHz** (INSTR PRESET), **RECALL**, 8. Adjust AMPTD CAL for a marker amplitude reading of -10 dBm.
 - c. Press **RECALL**, 9. Adjust **FREQ ZERO** for a maximum amplitude response.
7. Connect the Type N cable from the tracking generator output to the microwave spectrum analyzer RF INPUT. See Figure 1-26.

Option 011 only: Use the minimum loss adapter and Type N (f) to BNC (m) adapter.

8. Set the microwave spectrum analyzer controls as follows:

CENTER FREQUENCY	10 MHz
SPAN	10 MHz
REFERENCE LEVEL	+5 dBm
RES BW	30 kHz
LOG dB/DIV	10 dB

20. Harmonic Spurious Outputs

9. On the microwave spectrum analyzer, do the following:
 - a. Press **PEAK SEARCH** and **SIGNAL TRACK** (ON). Wait for the signal to be displayed at center screen.
 - b. Press **PEAK SEARCH**, **MKR -> CF STEP**, **Δ**, and **SIGNAL TRACK** (OFF).
 - c. Press **CENTER FREQUENCY**, **↑** (step-up key) to tune to the second harmonic. Press **PEAK SEARCH**. Record the marker amplitude reading in Table 1-21 as the 2nd Harmonic Level for the 10 MHz Tracking Generator Output Frequency.
 - d. Perform this step only if the tracking generator output frequency is less than 600 MHz. Press **CENTER FREQUENCY**, **↑** (step-up) key to tune to the third harmonic. Press **PEAK SEARCH**. Record the marker amplitude reading in Table 1-21 as the 3rd Harmonic Level for the 10 MHz Tracking Generator Output Frequency.
 - e. Press **MARKER** **OFF**.
10. Repeat steps 8 and 9 above for the remaining Tracking Generator Output Frequencies listed in Table 1-21. Note that the spectrum analyzer CENTER FREQ is the same as the Tracking Generator Output Frequency.
11. Locate the most positive 2nd Harmonic Level in Table 1-21 and record as TR Entry 1 in the performance test record.
12. Locate the most positive 3rd Harmonic Level in Table 1-21 and record as TR Entry 2 in the performance test record.

Table 1-21. Harmonic Spurious Responses Worksheet

Tracking Generator Frequency	2nd Harmonic Level (dBc)	3rd Harmonic Level (dBc)	Measurement Uncertainty (dB)
10 MHz			+1.55/-1.80
100 MHz			+1.55/-1.80
300 MHz			+1.55/-1.80
850 MHz		N/A	+1.55/-1.80

21. Non-Harmonic Spurious Outputs

This procedure is only for spectrum analyzers equipped with Option 010 or 011.

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is then connected to the input of a microwave spectrum analyzer. The tracking generator is set to several different output frequencies.

For each output frequency, several sweeps are taken on the microwave spectrum analyzer over different frequency spans and the highest displayed spurious response is measured in each span. Responses at the fundamental frequency of the tracking generator output or their harmonics are ignored. The amplitude of the highest spurious response is recorded.

There are no related adjustment procedures for this performance test.

Equipment Required

- Microwave spectrum analyzer
- Adapter, Type N (m) to BNC (f)
- Cable, Type N, 62 cm (24 in)
- Cable, BNC, 23 cm (9 in)

Additional Equipment for Option 011

- Adapter, minimum loss
- Adapter, Type N (f) to BNC (m), 75 Ω
- Cable, BNC, 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.

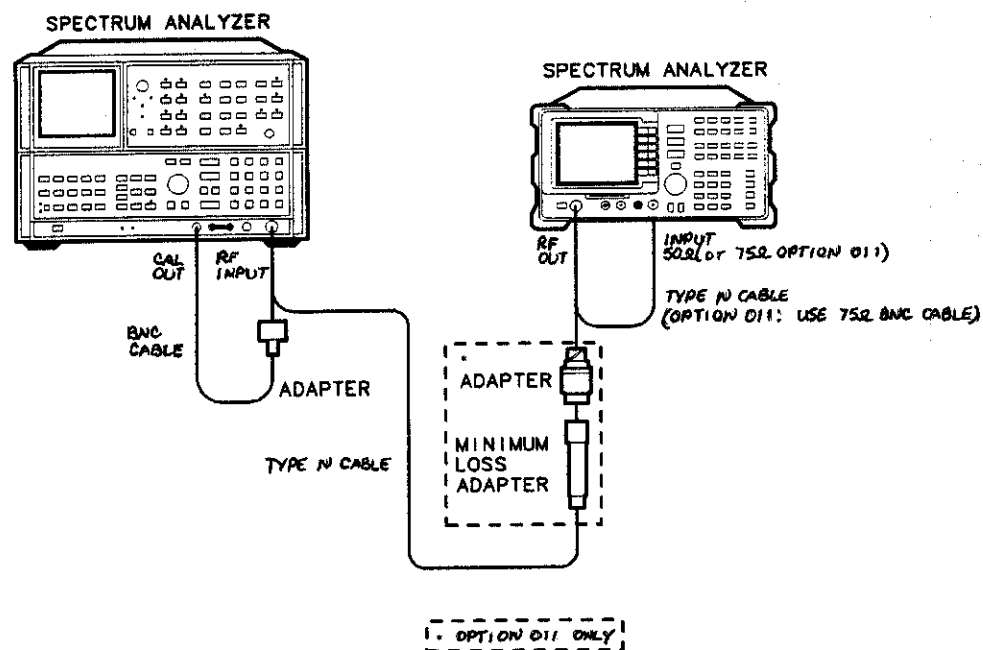


Figure 1-27. Non-Harmonic Spurious Outputs Test Setup

21. Non-Harmonic Spurious Outputs

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 1-27.

Option 011 only: Connect the 75 Ω BNC cable between the RF OUT 75 Ω and INPUT 75 Ω on the spectrum analyzer.

2. Press **[PRESET]** on the spectrum analyzer and set the controls as follows:

[FREQUENCY] 300 **[MHz]**

[SPAN] 0 **[Hz]**

[BW] 30 **[MHz]**

3. On the spectrum analyzer, press the following keys:

[MKR]

[AUX CTRL] Track Gen

SRC PWR ON OFF 5 **[−dBm]**

Option 011 only: SRC PWR ON OFF 38 **[+dBm]** (+38 dBmV).

4. On the spectrum analyzer, press **TRACKING PEAK**. Wait for the **PEAKING** message to disappear.

5. On the spectrum analyzer, press 0 **[+dBm]** then **[SGL SWP]**.

Option 011 only: 42.8 **[+dBm]**.

It is only necessary to perform step 6 if more than two hours have elapsed since a front-panel calibration of the microwave spectrum analyzer has been performed. The microwave spectrum analyzer should be allowed to warm up for at least 30 minutes before proceeding.

6. Perform a front-panel calibration on the microwave spectrum analyzer as follows:

- a. Connect a BNC cable between CAL OUTPUT and RF INPUT.
- b. Press **[2 – 22 GHz]** (**INSTR PRESET**), **[RECALL]**, 8. Adjust **AMPTD CAL** for a marker amplitude reading of −10 dBm.
- c. Press **[RECALL]**, 9. Adjust **FREQ ZERO** for a maximum amplitude response.

Press **[SHIFT]**, **[FREQUENCY SPAN]** to start the 30 second internal error correction routine.

- d. Press **[SHIFT]**, **[START FREQ]** to use the error correction factors just calculated.

7. Connect the Type N cable from the tracking generator output to the microwave spectrum analyzer RF INPUT as shown in Figure 1-27.

Option 011 only: Use the minimum loss adapter and Type N (f) to BNC (m) adapter.

8. Set the spectrum analyzer **CENTER FREQ** to the Fundamental Frequency listed in Table 1-22.

9. Set the microwave spectrum analyzer controls as follows:

SPAN	100 kHz
REFERENCE LEVEL	+5 dBm
ATTEN	20 dB
LOG dB/DIV	10 dB

10. Set the microwave spectrum analyzer **CENTER FREQUENCY** to the Fundamental Frequency listed in Table 1-22.

21. Non-Harmonic Spurious Outputs

11. On the microwave spectrum analyzer, press **PEAK SEARCH**. Press **MKR -> CF**, **MKR -> REF LVL**. Wait for another sweep to finish.
12. Record the microwave spectrum analyzer marker-amplitude reading in Table 1-22 as the Fundamental Amplitude.
13. Set the microwave spectrum analyzer **START FREQ**, **STOP FREQ**, and **RES BW** as indicated in the first row of Table 1-23.
14. Press **SINGLE** on the microwave spectrum analyzer and wait for the sweep to finish. Press **PEAK SEARCH**.
15. Verify that the marked signal is not the fundamental or a harmonic of the fundamental as follows:
 - a. Divide the marker frequency by the fundamental frequency (the spectrum analyzer CENTER FREQ setting). For example, if the marker frequency is 30.3 MHz and the fundamental frequency is 10 MHz, dividing 30.3 MHz by 10 MHz yields 3.03.
 - b. Round the number calculated in step a the nearest whole number. In the example above, 3.03 should be rounded to 3.
 - c. Multiply the fundamental frequency by the number calculated in step b. Following the example, multiplying 10 MHz by 3 yields 30 MHz.
 - d. Calculate the difference between the marker frequency and the frequency calculated in step c above. Continuing the example, the difference would be 300 kHz.
 - e. Due to span accuracy uncertainties in the microwave spectrum analyzer and center frequency uncertainties in the spectrum analyzer, the marker frequency might not equal the actual frequency. Given the marker frequency, check if the difference calculated in step d is within the appropriate tolerance:
For marker frequencies <55 MHz, tolerance = ± 750 kHz
For marker frequencies >55 MHz, tolerance = ± 10 MHz
 - f. If the difference in step d is within the indicated tolerance, the signal in question is the fundamental signal (if the number in step b = 1) or a harmonic of the fundamental (if the number in step b > 1). This response should be ignored.
16. Verify that the marked signal is a true response and not a random noise peak by pressing **SINGLE** to trigger a new sweep and press **PEAK SEARCH**. A true response will remain at the same frequency and amplitude on successive sweeps but a noise peak will not.
17. If the marked signal is either the fundamental or a harmonic of the fundamental (see step 15) or a noise peak (see step 16), move the marker to the next highest signal by pressing **SHIFT**, **PEAK SEARCH**. Continue with step 19.
18. If the marked signal is not the fundamental or a harmonic of the fundamental (see step 15) and is a true response (see step 16), calculate the difference between the amplitude of marked signal and the Fundamental Amplitude as listed in Table 1-22.

For example, if the Fundamental Amplitude for a fundamental frequency of 10 MHz is +1.2 dBm and the marker amplitude is -40.8 dBm, the difference is -42 dBc.

Record this difference as the Non-Harmonic Response Amplitude for the appropriate spectrum analyzer CENTER FREQ and microwave spectrum analyzer START and STOP FREQ settings in Table 1-23.

$$\text{Non-Harmonic Amplitude} = \text{Marker Amplitude} - \text{Fundamental Amplitude}$$

19. If a true non-harmonic spurious response is not found, record "NOISE" as the Non-Harmonic Response Amplitude in Table 1-23 for the appropriate spectrum analyzer CENTER FREQ and microwave spectrum analyzer START and STOP FREQ settings.

21. Non-Harmonic Spurious Outputs

20. Repeat steps 14 through 19 for the remaining microwave spectrum analyzer settings for **START FREQ**, **STOP FREQ**, and **RES BW** for the spectrum analyzer **CENTER FREQ** setting of 10 MHz.
21. Repeat steps 8 through 20 with the spectrum analyzer **CENTER FREQ** set to 900 MHz.
22. Repeat steps 8 through 20 with the spectrum analyzer **CENTER FREQ** set to 1.8 GHz.
23. Locate in Table 1-23 the most-positive Non-Harmonic Response Amplitude. Record this amplitude as TR Entry 1 in the performance test record.

Table 1-22. Fundamental Response Amplitudes Worksheet

Fundamental Frequency	Fundamental Amplitude (dBm)
10 MHz	_____
900 MHz	_____
1.8 GHz	_____

Table 1-23. Non-Harmonic Responses Worksheet

Microwave Spectrum Analyzer Settings			Non-Harmonic Response Amplitude (dBc)			Measurement Uncertainty
Start Freq (MHz)	Stop Freq (MHz)	Res BW	@10 MHz Center Freq	@900 MHz Center Freq	@1.8 GHz Center Freq	(dB)
0.1*	5.0	10 kHz	_____	_____	_____	+1.55/-1.80
5.0	55	100 kHz	_____	_____	_____	+1.55/-1.80
55	1240	1 MHz	_____	_____	_____	+1.55/-1.80
1240	1800	1 MHz	_____	_____	_____	+1.55/-1.80

* Option 011: Set **START FREQ** to 1 MHz.

22. Tracking Generator Feedthrough

This procedure is only for spectrum analyzers equipped with Option 010 or 011.

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is terminated and set for 0 dBm output power (maximum output power). The spectrum analyzer input is also terminated. The noise level of the spectrum analyzer is then measured at several frequencies.

There is no related adjustment procedure for this performance test.

Equipment Required

- Termination, 50 Ω (2 required)
- Adapter, Type N (m) to BNC (f)
- Cable, Type N, 62 cm (24 in)
- Cable, 23 cm (9 in)

Additional Equipment for Option 011

- Termination, 75 Ω Type N (m) (2 required)
- Adapter, Type N (f) to BNC (m), 75 Ω (2 required)
- Cable, BNC, 75 Ω

Caution Use only 75 Ω cables, connectors, or adapters on the 75 Ω input of an Option 011 or damage to the input connector will occur.

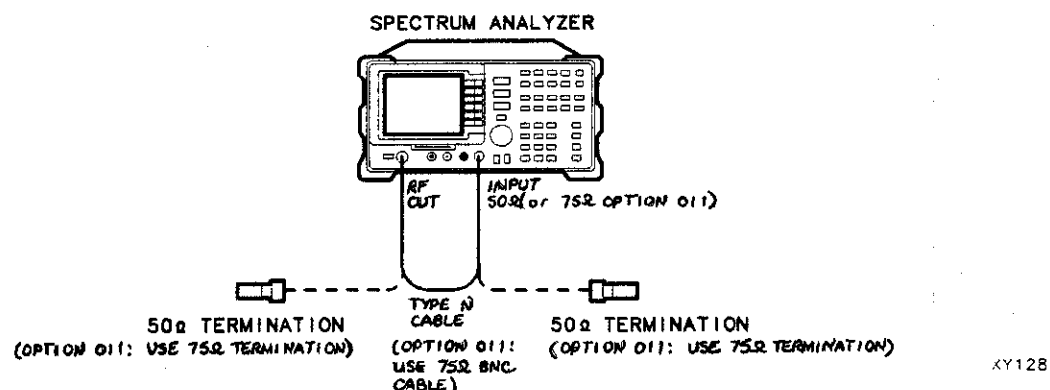


Figure 1-28. Tracking Generator Feedthrough Test Setup

22. Tracking Generator Feedthrough

Procedure

1. Connect the Type N cable between the RF OUT 50 Ω and INPUT 50 Ω connectors on the spectrum analyzer. See Figure 1-28.
Option 011 only: Connect the 75 Ω BNC cable between the RF OUT 75 Ω and INPUT 75 Ω connectors on the spectrum analyzer.
2. Press **PRESET** on the spectrum analyzer and set the controls as follows:

FREQUENCY 300 **MHz**
SPAN 1 **MHz**

3. On the spectrum analyzer, press the following keys:

MKR
AUX CTRL Track Gen
SRC PWR ON OFF 5 **-dBm**

Option 011 only: 42 +dBm (+42 dBmV).

4. On the spectrum analyzer, press **TRACKING PEAK**. Wait for the **PEAKING** message to disappear.
5. Connect the **CAL OUTPUT** to the **INPUT 50 Ω** .

Option 011 only: Connect the **CAL OUTPUT** to the **INPUT 75 Ω** .

Set the spectrum analyzer controls as follows:

AMPLITUDE 20 **-dBm**
Option 011 only: **AMPLITUDE** REF LVL 28.75 **+dBm**
SPAN 10 **MHz**
AMPLITUDE
ATTEN AUTO MAN 0 **dB**

6. On the spectrum analyzer, press the following keys:

PEAK SEARCH
MKR FCTN MK TRACK ON OFF (ON)
SPAN 100 **kHz**

Wait for the **AUTO ZOOM** message to disappear then set the controls as follows:

BW VID BW AUTO MAN 30 **Hz**
MKR FCTN MK TRACK ON OFF (OFF)

22. Tracking Generator Feedthrough

7. Press **[SGL SWP]** and wait for completion of a new sweep. Press the following spectrum analyzer keys:

[PEAK SEARCH]

[AMPLITUDE] More 1 of 3

REF LVL OFFSET

Subtract the **[MKR]** amplitude reading from -20 dBm and enter the result as the REF LVL OFFSET.

For example, if the marker reads -20.21 dBm, enter +0.21 dB

$$[-20 \text{ dBm} - (-20.21 \text{ dBm}) = +0.21 \text{ dB}]$$

Example for *Option 011*: If the marker reads 26.4 dBmV, enter +2.35 dB

$$(28.75 \text{ dBmV} - 26.4 \text{ dBmV} = 2.35 \text{ dB})$$

REF LVL OFFSET _____ dB

8. Connect one 50 Ω termination to the spectrum analyzer INPUT 50 Ω and another to the tracking generator's RF OUT 50 Ω .

Option 011 only: Connect one 75 Ω termination to the spectrum analyzer INPUT 75 Ω and another to the tracking generator's RF OUT 75 Ω .

9. Press **[AUX CTRL]**, Track Gen, then SRC PWR ON OFF (OFF) on the spectrum analyzer.
10. Set the spectrum analyzer controls as follows:

[FREQUENCY] 0 **[Hz]**

[SPAN] 10 **[MHz]**

[AMPLITUDE] 10 **[dBm]**

Option 011 only: **[AMPLITUDE]** REF LVL 38.75 **[dBm]**

[BW]

VID BW AUTO MAN (AUTO)

[MKR] More 1 of 2

MARKER ALL OFF

[TRIG]

SWEEP CONT SGL (CONT)

11. Press the following spectrum analyzer keys:

[PEAK SEARCH]

[MKR FCTN] MK TRACK ON OFF (ON)

[MKR ->] MARKER ->REF LVL

[SPAN] 2 **[MHz]**

Wait for the AUTO ZOOM message to disappear, then press **[MKR FCTN]**, MK TRACK ON OFF (OFF).

22. Tracking Generator Feedthrough

12. Press **FREQUENCY** and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the spectrum analyzer controls as follows:
SPAN 50 **kHz**
AMPLITUDE 50 **-dBm**
Option 011 only: **AMPLITUDE** REF LVL 1.25 **-dBm**
BW
VID BW AUTO MAN 30 **Hz**
13. On the spectrum analyzer, press **AUX CTRL**, Track Gen, SRC PWR ON OFF 0 **+dBm**.
Option 011 only: 42.8 **+dBm** (+42.8 dBmV).
14. Press **SGL SWP** and wait for completion of a new sweep. Press **DISPLAY** then
 DSP LINE ON OFF (ON).
15. Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Record the display line amplitude setting in Table 1-24 as the noise level at 1 MHz.
16. Repeat steps 14 and 15 for the remaining Tracking Generator Output Frequencies (spectrum analyzer CENTER FREQ) listed in Table 1-24.
17. In Table 1-24, locate the most positive Noise Level Amplitude. Record this amplitude as TR Entry 1 in the performance test record.

Table 1-24. TG Feedthrough Worksheet

Tracking Generator Output Frequency	Noise Level Amplitude (dBm or dBmV)	Measurement Uncertainty (dB)
1 MHz		+1.15/-1.24
20 MHz		+1.15/-1.24
50 MHz		+1.15/-1.24
100 MHz		+1.15/-1.24
250 MHz		+1.15/-1.24
400 MHz		+1.15/-1.24
550 MHz		+1.15/-1.24
700 MHz		+1.15/-1.24
850 MHz		+1.15/-1.24
1000 MHz		+1.15/-1.24
1150 MHz		+1.15/-1.24
1300 MHz		+1.15/-1.24
1450 MHz		+1.15/-1.24
1600 MHz		+1.15/-1.24
1750 MHz		+1.15/-1.24

Performance Verification Test Record

Table 1-25. Performance Verification Test Record

Hewlett-Packard Company		Report No. _____	
Address: _____		Date _____	
_____		(e.g. 10 SEP 1989)	

Model HP 8590L			
Serial No. _____			
Options _____			
Firmware Revision _____			
Customer _____		Tested by _____	
Ambient temperature _____ °C		Relative humidity _____ %	
Power mains line frequency _____ Hz (nominal)			
Test Equipment Used:			
Description	Model No.	Trace No.	Cal Due Date
Synthesized Sweeper	_____	_____	_____
Synthesizer/Function Generator	_____	_____	_____
Synthesizer/Level Generator	_____	_____	_____
AM/FM Signal Generator	_____	_____	_____
Measuring Receiver	_____	_____	_____
Power Meter	_____	_____	_____
RF Power Sensor	_____	_____	_____
High-Sensitivity Power Sensor	_____	_____	_____
Microwave Frequency Counter	_____	_____	_____
Universal Frequency Counter	_____	_____	_____
Frequency Standard	_____	_____	_____
Power Splitter	_____	_____	_____
Minimum Loss Adapter	_____	_____	_____
(Options 001 and 011 only)	_____	_____	_____
50 MHz Low-Pass Filter	_____	_____	_____
50 Ω Termination	_____	_____	_____
75 Ω Termination (Options 001 and 011 only)	_____	_____	_____
Microwave Spectrum Analyzer	_____	_____	_____
(Options 010 and 011 only)	_____	_____	_____
Notes/Comments:			

Table 1-25. Performance Verification Test Record (page 2 of 7)

Hewlett-Packard Company Model HP 8590L	Report No. _____
Serial No. _____	Date _____

Test Description	Results Measured (TR Entry)			Measurement Uncertainty
	Min		Max	
1. 10 MHz Reference Accuracy	Frequency Error _____			
Settability	-150 Hz	(1) _____	+150 Hz	$\pm 4.2 \times 10^{-9}$
2. Frequency Readout Accuracy and Marker Count Accuracy	Frequency (MHz) _____			
Frequency Readout Accuracy				
SPAN				
20 MHz	1.49918	(1) _____	1.50082	± 2.5 Hz
10 MHz	1.49958	(2) _____	1.50042	± 12.5 Hz
1 MHz	1.4999680	(3) _____	1.500032	± 25.0 Hz
Marker Count Accuracy				
SPAN				
(CNT RES - 10 Hz) 1 MHz	1.4999989	(4) _____	1.5000011	± 1 Hz
(CNT RES - 100 Hz) 20 MHz	1.4999989	(5) _____	1.5000011	± 1 Hz
3. Frequency Readout Accuracy	Frequency (MHz) _____			
Option 713 Only:				
FREQUENCY				
10 MHz	4.9980	(1) _____	15.0020	± 2.5 Hz
50 MHz	44.9980	(2) _____	55.0020	± 12.5 Hz
100 MHz	94.9980	(3) _____	1.50000076	± 25.0 Hz
500 MHz	494.9980	(4) _____	505.0020	± 125.0 Hz
1000 MHz	994.9980	(5) _____	1005.0020	± 250.0 Hz
1800 MHz	1794.9980	(6) _____	1805.0020	± 450.0 Hz
4. Noise Sidebands				
Suppression		(1) _____	-65 dBc	± 1.0 dB
5. System Related Sidebands				
Sideband Below Signal		(1) _____	-65 dBc	± 1.0 dB
Sideband Above Signal		(2) _____	-65 dBc	± 1.0 dB
6. Frequency Span Readout Accuracy	MKRA Reading _____			
SPAN				
1800 MHz	1446.00 MHz	(1) _____	1554.00 MHz	± 6.37 MHz
100.00 MHz	77.00 MHz	(2) _____	83.00 MHz	± 637 kHz
20.00 MHz	15.40 MHz	(3) _____	16.60 MHz	± 70.8 kHz
10.00 MHz	7.40 MHz	(4) _____	8.30 MHz	± 35.4 kHz
100.00 kHz	77.00 kHz	(5) _____	83.00 kHz	± 354 Hz

Table 1-25. Performance Verification Test Record (page 3 of 7)

Hewlett-Packard Company Model HP 8590L	Report No. _____
Serial No. _____	Date _____

Test Description	Results Measured			Measurement Uncertainty
	Min	(TR Entry)	Max	
7. Sweep Time Accuracy	MKRA Reading			
SWEEP TIME				
20 ms	15.4 ms	(1) _____	16.6 ms	±0.057 ms
100 ms	77.0 ms	(2) _____	83.0 ms	±0.283 ms
1 s	770.0 ms	(3) _____	830.0 ms	±2.83 ms
10 s	7.7 s	(4) _____	8.3 s	±23.8 ms
8. Scale Fidelity	Cumulative Error			
Log Mode				
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
-4	-4.44 dB	(1) _____	-3.56 dB	±0.06 dB
-8	-8.48 dB	(2) _____	-7.52 dB	±0.06 dB
-22	-12.52 dB	(3) _____	-11.48 dB	±0.06 dB
-16	-16.56 dB	(4) _____	-15.44 dB	±0.06 dB
-20	-20.60 dB	(5) _____	-19.40 dB	±0.06 dB
-24	-24.64 dB	(6) _____	-23.36 dB	±0.06 dB
-28	-28.68 dB	(7) _____	-27.32 dB	±0.06 dB
-32	-32.72 dB	(8) _____	-31.28 dB	±0.06 dB
-36	-36.76 dB	(9) _____	-35.24 dB	±0.06 dB
-40	-40.80 dB	(10) _____	-39.20 dB	±0.06 dB
-44	-44.84 dB	(11) _____	-43.16 dB	±0.06 dB
-48	-48.88 dB	(12) _____	-47.12 dB	±0.06 dB
-52	-52.92 dB	(13) _____	-51.08 dB	±0.06 dB
-56	-56.96 dB	(14) _____	-55.04 dB	±0.06 dB
-60	-61.00 dB	(15) _____	-59.00 dB	±0.11 dB
-64	-65.04 dB	(16) _____	-62.96 dB	±0.11 dB
-68	-69.08 dB	(17) _____	-66.92 dB	±0.11 dB

Table 1-25. Performance Verification Test Record (page 4 of 7)

Hewlett-Packard Company Model HP 8590L	Report No. _____
Serial No. _____	Date _____

Test Description	Results Measured			Measurement Uncertainty
	Min	(TR Entry)	Max	
8. Scale Fidelity (continued)				
Log Mode		Incremental Error		
dB from Ref Level				
0	0 (Ref)	0 (Ref)	0 (Ref)	
-4	-0.4 dB	(18) _____	+0.4 dB	±0.06 dB
-8	-0.4 dB	(19) _____	+0.4 dB	±0.06 dB
-22	-0.4 dB	(20) _____	+0.4 dB	±0.06 dB
-16	-0.4 dB	(21) _____	+0.4 dB	±0.06 dB
-20	-0.4 dB	(22) _____	+0.4 dB	±0.06 dB
-24	-0.4 dB	(23) _____	+0.4 dB	±0.06 dB
-28	-0.4 dB	(24) _____	+0.4 dB	±0.06 dB
-32	-0.4 dB	(25) _____	+0.4 dB	±0.06 dB
-36	-0.4 dB	(26) _____	+0.4 dB	±0.06 dB
-40	-0.4 dB	(27) _____	+0.4 dB	±0.06 dB
-44	-0.4 dB	(28) _____	+0.4 dB	±0.06 dB
-48	-0.4 dB	(29) _____	+0.4 dB	±0.06 dB
-52	-0.4 dB	(30) _____	+0.4 dB	±0.06 dB
-56	-0.4 dB	(31) _____	+0.4 dB	±0.06 dB
-60	-0.4 dB	(32) _____	+0.4 dB	±0.11
Linear Mode				
% of Ref Level				
100.00	0 (Ref)	0 (Ref)	0 (Ref)	
70.70	151.59 mV	(33) _____	165.01 mV	±1.84 mV
50.00	105.36 mV	(34) _____	118.78 mV	±1.84 mV
35.48	72.63 mV	(35) _____	86.05 mV	±1.84 mV
25.00	49.46 mV	(36) _____	82.88 mV	±1.84 mV
Log-to-Linear Switching				
	-0.25 dB	(37) _____	+0.25 dB	±0.05 dB

Table 1-25. Performance Verification Test Record (page 5 of 7)

Hewlett-Packard Company Model HP 8590L	Report No. _____
Serial No. _____	Date _____

Test Description	Min	Results Measured (TR Entry)	Max	Measurement Uncertainty
9. Reference Level Accuracy				
Reference Level (dBm)	Log Mode			
-20	0 (Ref)	0 (Ref)	0 (Ref)	
-10	-0.40 dB	(1) _____	+0.40 dB	±0.06 dB
0	-0.50 dB	(2) _____	+0.50 dB	±0.06 dB
-30	-0.40 dB	(3) _____	+0.40 dB	±0.06 dB
-40	-0.50 dB	(4) _____	+0.50 dB	±0.08 dB
-50	-0.80 dB	(5) _____	+0.80 dB	±0.06 dB
-60	-1.00 dB	(6) _____	+1.00 dB	±0.12 dB
-70	-1.10 dB	(7) _____	+1.10 dB	±0.12 dB
-80	-1.20 dB	(8) _____	+1.20 dB	±0.12 dB
-90	-1.30 dB	(9) _____	+1.30 dB	±0.12 dB
Reference Level (dBm)	Linear Mode			
-20	0 (Ref)	0 (Ref)	0 (Ref)	
-10	-0.40 dB	(10) _____	+0.40 dB	±0.06 dB
0	-0.50 dB	(11) _____	+0.50 dB	±0.06 dB
-30	-0.40 dB	(12) _____	+0.40 dB	±0.06 dB
-40	-0.50 dB	(13) _____	+0.50 dB	±0.08 dB
-50	-0.80 dB	(14) _____	+0.80 dB	±0.06 dB
-60	-1.00 dB	(15) _____	+1.00 dB	±0.12 dB
-70	-1.10 dB	(16) _____	+1.10 dB	±0.12 dB
-80	-1.20 dB	(17) _____	+1.20 dB	±0.12 dB
-90	-1.30 dB	(18) _____	+1.30 dB	±0.12 dB
10. Absolute Amplitude Calibration and Resolution Bandwidth Switching Uncertainties				
Absolute Amplitude Uncertainty	-20.15 dB	(1) _____	-19.85 dB	n/a
Resolution Bandwidth Switching Uncertainty				
Resolution Bandwidth				
3 kHz	0 (Ref)	0 (Ref)	0 (Ref)	
1 kHz	-0.5 dB	(2) _____	+0.5 dB	+0.07/-0.08 dB
9 kHz	-0.4 dB	(3) _____	+0.4 dB	+0.07/-0.08 dB
10 kHz	-0.4 dB	(4) _____	+0.4 dB	+0.07/-0.08 dB
30 kHz	-0.4 dB	(5) _____	+0.4 dB	+0.07/-0.08 dB
100 kHz	-0.4 dB	(6) _____	+0.4 dB	+0.07/-0.08 dB
120 kHz	-0.4 dB	(7) _____	+0.4 dB	+0.07/-0.08 dB
300 kHz	-0.4 dB	(8) _____	+0.4 dB	+0.07/-0.08 dB
1 MHz	-0.4 dB	(9) _____	+0.4 dB	+0.07/-0.08 dB
3 MHz	-0.4 dB	(10) _____	+0.4 dB	+0.07/-0.08 dB

Table 1-25. Performance Verification Test Record (page 6 of 7)

Hewlett-Packard Company Model HP 8590L	Report No. _____
Serial No. _____	Date _____

Test Description	Min	Results Measured (TR Entry)	Max	Measurement Uncertainty
11. Calibrator Amplitude and Frequency Accuracy				
Output Power	-20.4 dBm	(1) _____	-19.6 dBm	±0.2 dB
Output Power for <i>Option 001</i>	-28.35 dBmV	(2) _____	+29.15 dBmV	±0.2 dB
Frequency Output		(3) _____		±75 HzΔ
12. Frequency Response				
Max Positive Response		(1) _____	+1.5 dB	+0.32/-0.33 dB
Max Negative Response	-1.5 dB	(2) _____		+0.32/-0.33 dB
Peak-to-Peak Response		(3) _____	2.0 dB	+0.32/-0.33 dB
13. Other Input Related Spurious Responses				
		(1) _____	-55 dBc	±1.0 dB
14. Spurious Responses				
Second Harmonic Distortion		(1) _____	-45 dBc	+1.86/-2.27 dB
Third Order Intermodulation Distortion		(2) _____	-54 dBc	+2.07/-2.42 dB
15. Gain Compression				
		(1) _____	0.5 dB	+0.21/-0.22 dB
16. Displayed Average Noise				
Frequency				
400 kHz		(1) _____	-115 dBm	+1.15/-1.25 dB
1 MHz		(2) _____	-115 dBm	+1.15/-1.25 dB
1 MHz to 1.5 GHz		(3) _____	-115 dBm	+1.15/-1.25 dB
1.5 GHz to 1.8 GHz		(4) _____	-113 dBm	+1.15/-1.25 dB
<i>Option 001 only:</i>				
Frequency				
1 MHz		(2) _____	-63 dBmV	+1.15/-1.25 dB
1 MHz to 1.5 GHz		(3) _____	-63 dBmV	+1.15/-1.25 dB
1.5 GHz to 1.8 GHz		(4) _____	-61 dBmV	+1.15/-1.25 dB
17. Residual Responses				
150 kHz to 1.8 GHz		(1) _____	-90 dBm	+1.09/-1.15 dB
<i>Option 001 only:</i>				
1 MHz to 1.8 GHz		(1) _____	-38 dBmV	+1.09/-1.15 dB

Table 1-25. Performance Verification Test Record (page 7 of 7)

Hewlett-Packard Company Model HP 8590L	Report No. _____
Serial No. _____	Date _____

Test Description	Min	Results Measured (TR Entry)	Max	Measurement Uncertainty
18. Absolute Amplitude, Vernier, and Power Sweep Accuracy <i>Option 010 or 011 only:</i> Absolute Amplitude Accuracy Positive Vernier Accuracy Negative Vernier Accuracy Power Sweep Accuracy	 -1.0 dB -0.75 dB	(1) _____ (2) _____ (3) _____ (4) _____	 +1.0 dB +0.75 dB 1.5 dB	 +0.25/-0.26 dB ±0.033 dB ±0.033 dB ±0.033 dB
19. Tracking Generator Level Flatness <i>Option 010 only:</i> Maximum Flatness 100 kHz 300 kHz to 5 MHz 10 MHz to 1800 MHz Minimum Flatness 100 kHz 300 kHz to 5 MHz 10 MHz to 1800 MHz <i>Option 011 only:</i> Maximum Flatness 1 MHz to 1800 MHz Minimum Flatness 1 MHz to 1800 MHz	 -1.75 dB -1.75 dB -1.75 dB -1.75 dB	 (1) _____ (2) _____ (3) _____ (4) _____ (5) _____ (6) _____ (1) _____ (2) _____	 +1.75 dB +1.75 dB +1.75 dB +1.75 dB	 +0.42/-0.45 dB +0.28/-0.28 dB +0.24/-0.24 dB +0.42/-0.45 dB +0.28/-0.28 dB +0.24/-0.24 dB +0.18/-0.39 dB +0.18/-0.39 dB
20. Harmonic Spurious Outputs <i>Option 010 or 011 only:</i> 2nd Harmonic Level 3rd Harmonic Level		(1) _____ (2) _____	 -25 dBc -25 dBc	 +1.55/-1.80 dB +1.55/-1.80 dB
21. Non-Harmonic Spurious Outputs <i>Option 010 or 011 only:</i> Highest Non-Harmonic Response Amplitude		(1) _____	-30 dBc	+1.55/-1.80 dB
22. Tracking Generator Feedthrough <i>Option 010 only:</i> <i>Option 011 only:</i>		(1) _____ (1) _____	-106 dBm -57.24 dBmV	+1.15/-1.24 dB +1.15/-1.24 dB

Specifications and Characteristics

This chapter contains specifications and characteristics for the HP 8590D spectrum analyzer. The specifications and characteristics in this chapter are listed separately. The specifications are described first, then followed by the characteristics.

General	General specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Amplitude	Amplitude-related specifications and characteristics.
Option	Option-related specifications and characteristics.
Physical	Input, output and physical characteristics.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range 0 °C to +55 °C (unless otherwise noted). The spectrum analyzer will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 30 minutes after the spectrum analyzer is turned on and after the CAL frequency, and CAL amplitude routines have been run.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the spectrum analyzer. Characteristics are specifically identified.
- Typical Performance, where listed, is not warranted, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

General Specifications

All specifications apply over 0 °C to +55 °C. The analyzer will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 30 minutes after the analyzer is turned on and after CAL FREQ and CAL AMPTD have been run.

Temperature Range	
Operating	0 °C to +55 °C
Storage	-40 °C to +75 °C

EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class A.
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Audible Noise	<37.5 dBA pressure and <5.0 Bels power (ISODP7779)
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Power Requirements	
ON (LINE 1)	90 to 132 V rms, 47 to 440 Hz 195 to 250 V rms, 47 to 66 Hz Power consumption <500 VA; <180 W
Standby (LINE 0)	Power consumption <7 W

Environmental Specifications	Type tested to the environmental specifications of Mil-T-28800 class 5
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Frequency Specifications

Frequency Range	
50 Ω	9 kHz to 1.8 GHz
75 Ω (Option 001)	1 MHz to 1.8 GHz

Frequency Reference	
Aging	$\pm 2 \times 10^{-6}$ /year
Settability	$\pm 0.5 \times 10^{-6}$
Temperature Stability	$\pm 5 \times 10^{-6}$

Frequency Readout Accuracy (Start, Stop, Center, Marker)	$\pm(\text{frequency readout} \times \text{frequency reference error}^* + \text{span accuracy} + 1\% \text{ of span} + 20\% \text{ of RBW} + 100 \text{ Hz})^\dagger$
* frequency reference error = (aging rate $\times$ period of time since adjustment + initial achievable accuracy + temperature stability). See "Frequency Characteristics."	
† See "Drift" under "Stability" in Frequency Characteristics.	

Marker Count Accuracy [†]	
Frequency Span ≤ 10 MHz	$\pm(\text{marker frequency} \times \text{frequency reference error}^* + \text{counter resolution} + 100 \text{ Hz})$
Frequency Span > 10 MHz	$\pm(\text{marker frequency} \times \text{frequency reference error}^* + \text{counter resolution} + 1 \text{ kHz})$
Counter Resolution	
Frequency Span ≤ 10 MHz	Selectable from 10 Hz to 100 kHz
Frequency Span > 10 MHz	Selectable from 100 Hz to 100 kHz
* frequency reference error = (aging rate $\times$ period of time since adjustment + initial achievable accuracy and temperature stability). See "Frequency Characteristics."	
† Marker level to displayed noise level > 25 dB, RBW/SPAN ≥ 0.01 . Span ≤ 300 MHz. Reduce SPAN annotation is displayed when RBW/SPAN < 0.01 .	

Frequency Span	
Range	0 Hz (zero span), 50 kHz to 1.8 GHz
Resolution	Four digits
Accuracy	$\pm 3\%$ of span

Frequency Sweep Time	
Range	20 ms to 100 s
Accuracy	$\pm 3\%$
Sweep Trigger	Free Run, Single, Line, Video, External

Frequency Specifications

Stability	
Noise Sidebands	(1 kHz RBW, 30 Hz VBW and sample detector)
>30 kHz offset from CW signal	≤ -95 dBc/Hz
System-Related Sidebands	
>30 kHz offset from CW signal	≤ -65 dBc

Calibrator Output Frequency	300 MHz fundamental frequency
Accuracy	± 30 kHz

Amplitude Specifications

Amplitude Specifications

Amplitude Range	
50 Ω	-115 dBm to +30 dBm
75 Ω (Option 001)	-63 dBmV to +75 dBmV

Maximum Safe Input Level	(Input attenuator ≥ 10 dB)	
	50 Ω	75 Ω (Option 001)
Average Continuous Power	+30 dBm (1 W)	+75 dBmV (0.4 W)
Peak Pulse Power	+30 dBm (1 W)	+75 dBmV (0.4 W)
dc	25 Vdc	100 Vdc

Gain Compression	
> 10 MHz	≤ 0.5 dB (total power at input mixer* = -10 dBm)

* Mixer Power Level (dBm) = Input Power (dBm) - Input Attenuation (dB).

Displayed Average Noise Level	(Input terminated, 0 dB attenuation, 1 kHz RBW, 30 Hz VBW, sample detector)	
	50 Ω	75 Ω (Option 001)
400 kHz to 1 MHz	≤ -115 dBm	N/A
1 MHz to 1.5 GHz	≤ -115 dBm	≤ -63 dBmV
1.5 GHz to 1.8 GHz	≤ -113 dBm	≤ -61 dBmV

Spurious Responses	
Second Harmonic Distortion 5 MHz to 1.8 GHz	< -70 dBc for -45 dBm tone at input mixer.*
Third Order Intermodulation Distortion 5 MHz to 1.8 GHz	< -70 dBc for two -30 dBm tones at input mixer* and >50 kHz separation.
Other Input Related Spurious	< -65 dBc at ≥ 30 kHz offset, for -20 dBm tone at input mixer ≤ 1.8 GHz.
* Mixer Power Level (dBm) = Input Power (dBm) - Input Attenuation (dB). (For analyzers with Input 75 Ω , add another 5.7 dB to the Input Attenuator.)	

Residual Responses	(Input terminated and 0 dB attenuation)	
	50 Ω	75 Ω (Option 001)
150 kHz to 1 MHz	< -90 dBm	N/A
1 MHz to 1.8 GHz	< -90 dBm	< -38 dBmV

Amplitude Specifications

Display Range	
Log Scale	0 to -70 dB from reference level is calibrated; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps; eight divisions displayed.
Linear Scale	eight divisions
Scale Units	dBm, dBmV, dBμV, mV, mW, nV, nW, pW, μV, μW, V, and W

Marker Readout Resolution	0.05 dB for log scale 0.05% of reference level for linear scale
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Reference Level	
Range	
Log Scale	Minimum amplitude to maximum amplitude**
Linear Scale	-99 dBm to maximum amplitude**
Resolution	
Log Scale	±0.01 dB
Linear Scale	±0.12% of reference level
Accuracy	(referenced to -20 dBm reference level, 10 dB input attenuation, at a single frequency, in a fixed RBW)
0 dBm to -59.9 dBm	±(0.3 dB + .01 × dB from -20 dBm)
-60 dBm and below	±(0.6 dB + .01 × dB from -20 dBm)
** See "Amplitude Range."	

Frequency Response	(10 dB input attenuation)
	Absolute[§] Relative Flatness[†]
9 kHz to 1.8 GHz	±1.5 dB ±1.0 dB
† Referenced to midpoint between highest and lowest frequency response deviations.	
§ Referenced to 300 MHz CAL OUT.	

Calibrator Output Amplitude	
50 Ω	-20 dBm ±0.4 dB
75 Ω (Option 001)	+28.75 dB mV ±0.4 dB

Absolute Amplitude Calibration Uncertainty^{††}	±0.15 dB
†† Uncertainty in the measured absolute amplitude of the CAL OUT signal at the reference settings after CAL FREQ and CAL AMPTD self-calibration. Absolute amplitude reference settings are: Reference Level -20 dBm; Input Attenuation 10 dB; Center Frequency 300 MHz; Res BW 3 kHz; Video BW 300 Hz; Scale Linear; Span 50 kHz; Sweep Time Coupled, Top Graticule (reference level), Corrections ON.	

Input Attenuator	
Range	0 to 60 dB, in 10 dB steps

Resolution Bandwidth Switching Uncertainty	(At reference level, referenced to 3 kHz RBW)
3 kHz to 3 MHz RBW	±0.4 dB
1 kHz RBW	±0.5 dB

Amplitude Specifications

Linear to Log Switching	± 0.25 dB at reference level
Display Scale Fidelity	
Log Maximum Cumulative 0 to -70 dB from Reference Level	$\pm (0.4 \text{ dB} + 0.01 \times \text{dB from reference level})$
Log Incremental Accuracy 0 to -60 dB from Reference Level	$\pm 0.4 \text{ dB/4 dB}$
Linear Accuracy	$\pm 3\%$ of reference level

Option Specifications

Tracking Generator Specifications (Option 010 or 011)

All specifications apply over 0 °C to +55 °C. The spectrum-analyzer/tracking-generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum-analyzer/tracking-generator is turned on and after CAL FREQ, CAL AMPTD, CAL TRK GEN, and TRACKING PEAK have been run.

Warm-Up	30 minutes
Output Frequency	
Range	
50 Ω (Option 010)	100 kHz to 1.8 GHz
75 Ω (Option 011)	1 MHz to 1.8 GHz
Output Power Level	
Range	
50 Ω (Option 010)	0 to -15 dBm
75 Ω (Option 011)	+42.8 to +27.8 dBmV
Resolution	0.1 dB
Absolute Accuracy	± 1.5 dB (at 300 MHz and -10 dBm source power) (Option 011: use +38.8 dBmV instead of -10 dBm)
Vernier	
Range	15 dB
Accuracy	± 1.0 dB (referenced to -10 dBm source power) (Option 011: referenced to +38.8 dBmV instead of -10 dBm)
Output Power Sweep	
Range	
50 Ω (Option 010)	-15 dBm to 0 dBm
75 Ω (Option 011)	+27.8 to +42.8 dBmV
Resolution	0.1 dB
Accuracy (zero span)	<2 dB peak-to-peak
Output Flatness (referenced to 300 MHz)	± 1.75 dB

Option Specifications

Spurious Outputs	
50 Ω (Option 010)	(0 dBm output, 100 kHz to 1.8 GHz)
75 Ω (Option 011)	(+42.8 dBmV output, 1 MHz to 1.8 GHz)
Harmonic Spurs	< -25 dBc
Nonharmonic Spurs	< -30 dBc

Dynamic Range	
Tracking Generator Feedthrough	
50 Ω (Option 010)	< -106 dBm
75 Ω (Option 011)	< -57.24 dBmV

Frequency Characteristics

These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Frequency Reference	
Initial Achievable Accuracy	$\pm 0.5 \times 10^{-6}$
Aging	$\pm 1.0 \times 10^{-7}/\text{day}$

Stability	
Drift* (after warmup at stabilized temperature)	<2 kHz/minute of sweep time
Drift (Option 713)	<75 kHz/5 minutes after 2 hour warmup and 5 minutes after setting center frequency

* Because the analyzer is locked at the center frequency before each sweep, drift occurs only during the time of one sweep. For Line, Video or External trigger, additional drift occurs while waiting for the appropriate trigger signal.

Resolution Bandwidth (-3 dB)	
Range	1 kHz to 3 MHz, selectable in 1, 3 and 10 increments, accuracy $\pm 20\%$ and 5 MHz. Resolution bandwidths may be selected manually, or coupled to frequency span.
Shape	Synchronously tuned four poles. Approximately Gaussian shape.
60 dB/3 dB Bandwidth Ratio	
Resolution Bandwidth	
100 kHz to 3 MHz	15:1
30 kHz	16:1
3 kHz to 10 kHz	15:1
1 kHz	16:1

Video Bandwidth (-3 dB)	
Range	30 Hz to 1 MHz, selectable in 1, 3, 10 increments, accuracy $\pm 30\%$ and 3 MHz. Video bandwidths may be selected manually, or coupled to resolution bandwidth and frequency span.
Shape	Post detection, single pole low-pass filter used to average displayed noise.

FFT Bandwidth Factors	FLATTOP	HANNING	UNIFORM
Noise Equivalent Bandwidth [†]	3.63x	1.5x	1x
3 dB Bandwidth [†]	3.60x	1.48x	1x
Sidelobe Height	<-90 dB	-32 dB	-13 dB
Amplitude Uncertainty	0.10 dB	1.42 dB	3.92 dB
Shape Factor (60 dB BW/3 dB BW)	2.6	9.1	>300

[†] Multiply entry by one-divided-by-sweep time.

Frequency Characteristics

Input Level	> (-60 dBm + attenuator setting)
Signal Level	0 to -30 dB below reference level
FM Offset	
Resolution	400 Hz nominal
FM Deviation (FM GAIN)	
Resolution	1 kHz nominal
Range	10 kHz to 1 MHz
Bandwidth	FM deviation/2
FM Linearity	
(for modulating frequency < bandwidth/100)	$\leq 1\%$ of FM deviation - 290 Hz

Amplitude Characteristics

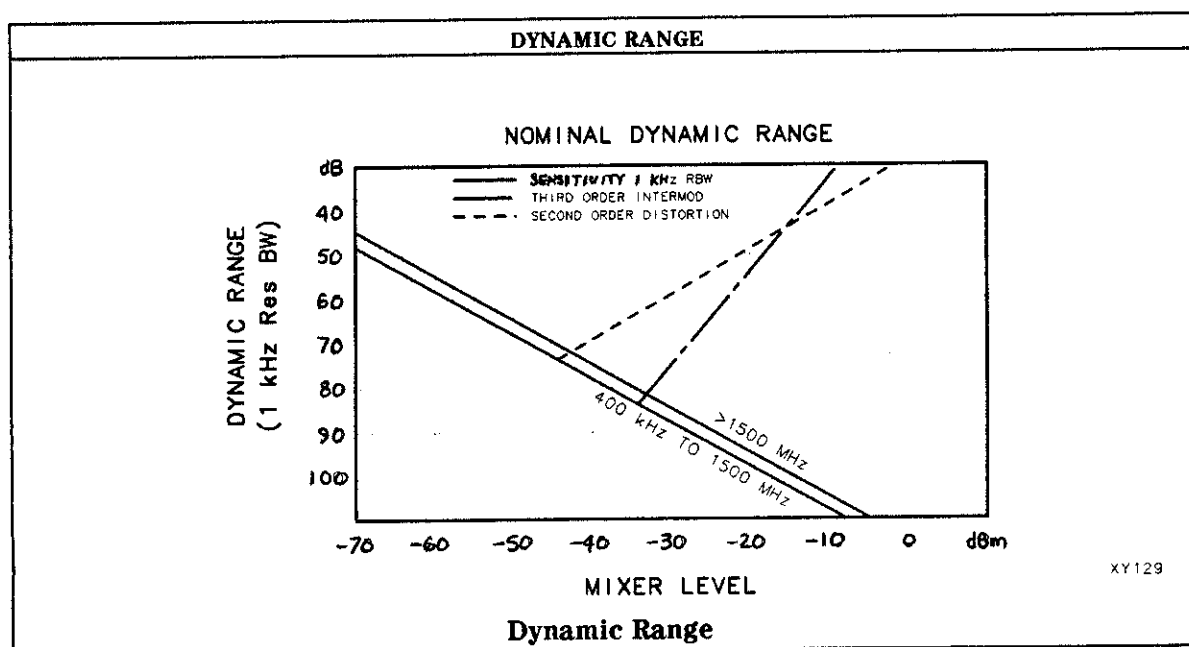
These are not specifications. Characteristics provide useful but nonwarranted information about instrument performance.

Log Scale Switching Uncertainty	Negligible error
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Input Attenuation Uncertainty*	
Attenuator Setting	
0 dB	± 0.5 dB
10 dB	Reference
20 dB	± 0.5 dB
30 dB	± 0.6 dB
40 dB	± 0.8 dB
50 dB	± 1.0 dB
60 dB	± 1.2 dB
* Referenced to 10 dB input attenuator setting from 9 kHz to 1.8 GHz. See the "Specifications" table under "Frequency Response."	

Input Attenuator Repeatability	
300 MHz	± 0.03 dB
1.8 GHz	± 1.0 dB

RF Input SWR	(Attenuator setting 10 to 60 dB) 1.35:1
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Amplitude Characteristics

Immunity Testing	
Radiated Immunity	When tested at 3 V/m according to IEC 801-3/1984 the displayed average noise level will be within specifications over the full immunity test frequency range of 27 to 500 MHz except that at immunity test frequencies of 278.6 MHz $\pm$ selected resolution bandwidth and 321.4 MHz $\pm$ selected resolution bandwidth the displayed average noise level may be up to -45 dBm. When the analyzer tuned frequency is identical to the immunity test signal frequency there may be signals of up to -70 dBm displayed on the screen.
Electrostatic Discharge	When an air discharge of up to 8 kV according to IEC 801-2/1991 occurs to the shells of the BNC connectors on the rear panel of the instrument spikes may be seen on the CRT display. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

Option Characteristics

Tracking Generator Characteristics (Option 010 or 011)

Output Tracking Drift (usable in 10 kHz bandwidth after 30-minute warmup)	1 kHz/5 minutes
Spurious Outputs (>1.8 GHz to 4.0 GHz) 50 Ω (Option 010) 0 dBm output 75 Ω (Option 011) ± 42.8 dBm V, output Harmonic Nonharmonic 2121.4 MHz Feedthrough (Option 010) (Option 011)	 < -20 dBc < -40 dBc < -45 dBm < +42.8 dBm V
RF Power-Off Residuals 100 kHz to 1.8 GHz (Option 010) 1 MHz to 1.8 GHz (Option 011)	 < -65 dBm < -16.2 dBm V
Dynamic Range (difference between maximum power out and tracking generator feedthrough) 100 kHz to 1.8 GHz (Option 010) 1 MHz to 1.8 GHz (Option 011)	 > 106 dB > 100 dB

Physical Characteristics

Front-Panel Inputs and Outputs

INPUT 500	
Connector	Type N female
Impedance	50 Ω nominal
INPUT 75Ω (Option 001)	
Connector	BNC female
Impedance	75 Ω nominal

RF OUT (Option 010, 011)	
Connector	Type N female
(Option 010)	BNC female
(Option 011)	
Impedance	
(Option 010)	50 Ω nominal
(Option 011)	75 Ω nominal
Maximum Safe Reverse Level	
(Option 010)	+20 dBm (0.1 W), 25 Vdc
(Option 011)	+69 dBmV (0.1 W), 100 Vdc

PROBE POWER[†]	
Voltage/Current	+15 Vdc, $\pm 7\%$ at 150 mA max. -12.6 Vdc $\pm 10\%$ at 150 mA max.

[†] Total current drawn from the +15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the -12.5 Vdc on the PROBE POWER and the -15 Vdc on the AUX INTERFACE cannot exceed 150 mA.

Rear-Panel Inputs and Outputs

10 MHz REF OUTPUT	
Connector	BNC female
Impedance	50 Ω nominal
Output Amplitude	>0 dBm

EXT REF IN	
Connector	BNC female
	Note: Analyzer noise sideband and spurious response performance may be affected by the quality of the external reference used.
Input Amplitude Range	-2 to +10 dBm
Frequency	10 MHz

Physical Characteristics

AUX IF OUTPUT Frequency Amplitude Range Impedance	21.4 MHz -10 to -60 dBm 50 Ω nominal
AUX VIDEO OUTPUT Connector Amplitude Range	BNC female 0 to 1 V (uncorrected)
EXT ALC INPUT (<i>Option 010 or 011</i>) Impedance Polarity Range Connector	1 M Ω Positive or negative -66 dBV to +6 dBV BNC
EXT KEYBOARD (<i>Option 021, 023 or 024</i>)	Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards.
EXT TRIG INPUT Connector Trigger Level	BNC female Positive edge initiates sweep in EXT TRIG mode (TTL).
HI-SWEEP IN/OUT Connector Output Input	BNC female High = sweep, Low = retrace (TTL) Open collector, low stops sweep.
MONITOR OUTPUT (<i>Spectrum Analyzer Display</i>) Connector Format SYNC NRM SYNC NTSC SYNC PAL	BNC female Internal Monitor NTSC Compatible 15.75 kHz horizontal rate 60 Hz vertical rate PAL Compatible 15.625 kHz horizontal rate 50 Hz vertical rate
REMOTE INTERFACE HP-IB (<i>Option 021</i>) HP-IB Codes RS-232 (<i>Option 023</i>) Parallel (<i>Option 024</i>)	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28 25 pin subminiature D-shell, female 25 pin subminiature D-shell, female

Physical Characteristics

SWEEP OUTPUT	
Connector	BNC female
Amplitude	0 to +10 V ramp

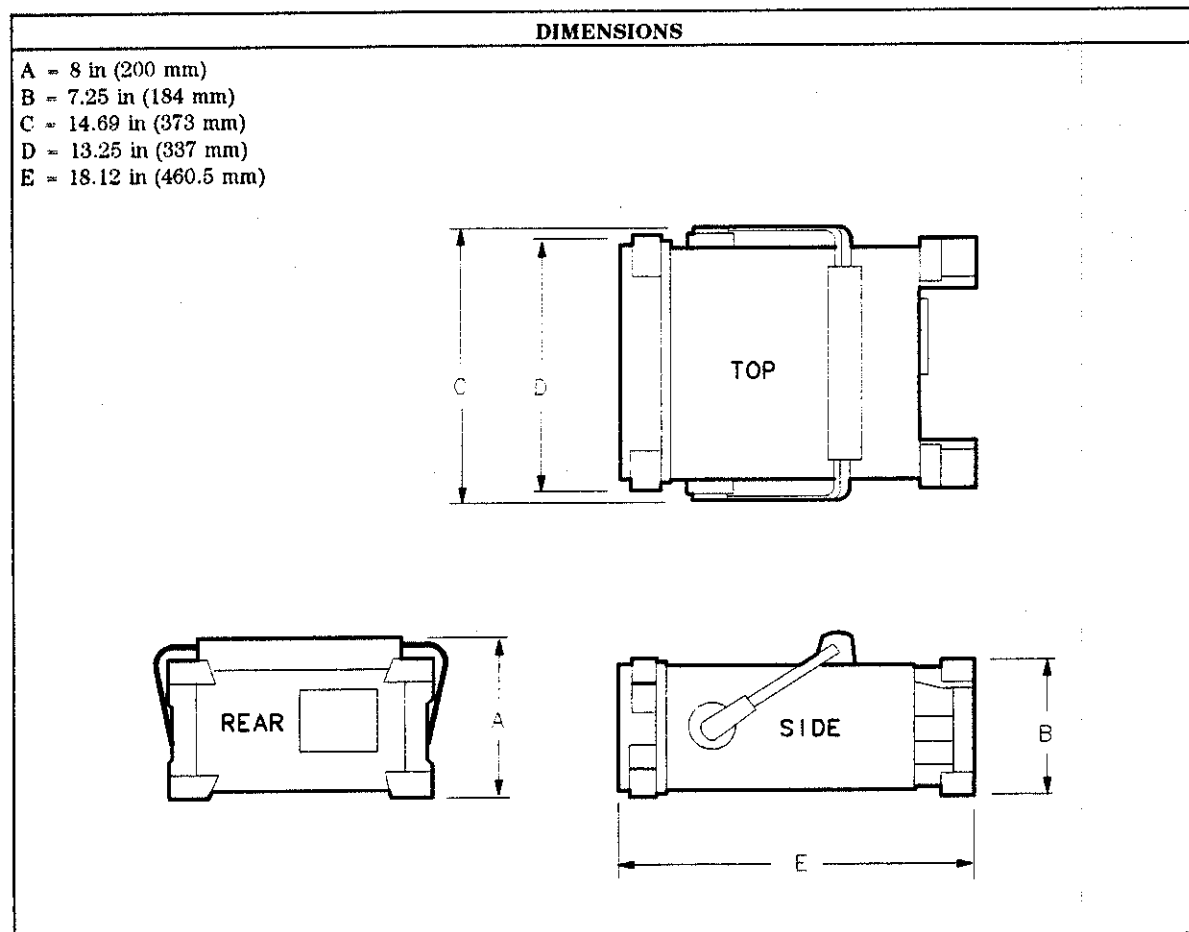
AUX INTERFACE				
Connector Type: 9 Pin Subminiature "D"				
Connector Pinout				
Pin #	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A	—	TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B	—	TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C	—	TTL Output Hi/Lo	Strobe
4	Control D	—	TTL Output Hi/Lo	Serial Data
5	Control I	—	TTL Input Hi/Lo	TTL Input Hi/Lo
6	Gnd	—	Gnd	Gnd
7†	-15 Vdc $\pm 7\%$	150 mA	—	—
8*	+5 Vdc $\pm 5\%$	150 mA	—	—
9†	+15 Vdc $\pm 5\%$	150 mA	—	—

* Exceeding the +5 V current limits may result in loss of factory correction constants.

† Total current drawn from the -15 Vdc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the -12.6 Vdc on the PROBE POWER and the -15 Vdc on the AUX INTERFACE cannot exceed 150 mA.

WEIGHT	
Net	
HP 8590L	14.1 kg (31 lb)
Shipping	
HP 8590L	16.8 kg (37 lb)

Physical Characteristics

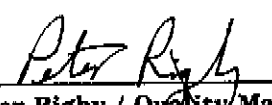


Regulatory Information

The information on the following pages apply to the HP 8590L and the HP 8592L spectrum analyzer products.

Regulatory Information

Declaration of Conformity

DECLARATION OF CONFORMITY according to ISO/IEC Guide 22 and EN 45014		
Manufacturer's Name:	Hewlett-Packard Co.	
Manufacturer's Address:	1212 Valleyhouse Drive Rohnert Park, California 94928-4999 U.S.A.	
Manufacturer's Name:	Hewlett-Packard Ltd.	
Manufacturer's Address:	South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom	
Declares that the product:		
Product Name:	Spectrum Analyzer	
Model Numbers:	HP 8590L and HP 8592L	
Product Options:	This declaration covers all options of the above products.	
Conforms to the following product specifications:		
Safety:	IEC 348:1978/HD 401:1980 CAN/CSA-22.2 No. 231 Series M89	
EMC:	CISPR 11:1990 /EN 55011:1991, Group 1 Class A IEC 801-2:1991 /EN 50082-1:1992, 4 kV CD, 8 kV AD IEC 801-3:1984 /EN 50082-1:1992, 3V/m, 27-500 MHz IEC 801-4:1988 /EN 50082-1:1992, 500 V signal, 1000 V AC	
Supplementary Information:		
The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.		
Rohnert Park, California	Jan 28, 1994	
Location	Date	Dixon Browder / Quality Manager
South Queensferry, Scotland	Feb 4, 1994	
Location	Date	Peter Rigby / Quality Manager
European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department ZQ/Standards Europe, Herrenberger Straße 130, D-7030 Böblingen (FAX: +49-7031-143143)		

Both the HP 8590B and the HP 8592B analyzers are complete, self-contained instruments. An ac power cable, suitable for use in the country to which the analyzer is originally shipped, is included with the unit.

Options and Accessories Available

Options

Many options are available to tailor the analyzer to your needs.

Options can be ordered by option number when you order the analyzer. Some of the options are also available as kits that can be ordered and installed after you have received your analyzer. The options are listed numerically by their option number.

75 Ω Input Impedance (Option 001)

Option 001 is available for the HP 8590B only. This option provides a 75 Ω input impedance instead of the standard 50 Ω impedance for the HP 8590B. Analyzers with this option use cables, circuit boards, and front panels that are different from the standard units.

Memory Card Reader (Option 003)

This option provides a memory card reader to save and recall data from a memory card. Analyzers with this option have an opening on the front panel to insert the memory card. Option 003 includes a 32 kilobyte memory card and a memory card holder.

Option 003 is also available as a kit (HP part number 5062-6456).

Tracking Generator (Option 010 or 011)

Option 010 or 011 is available for the HP 8590B only. Option 010 or 011 provides a 1.8 GHz built-in tracking generator. This source-receiver combination makes insertion-loss, frequency response, and return-loss measurements. The tracking generator has a wide distortion-free dynamic range, plus good sensitivity and selectivity. Option 010 has the standard 50 Ω input impedance, Option 011 has 75 Ω input impedance.

Option 010 or 011 is also available as a kit (HP part number 5062-6463 and 5062-6479 respectively).

HP-IB (Option 021)

Option 021 enables you to control your analyzer from a computer that uses an Hewlett-Packard interface bus (HP-IB). Such computers include the HP 9000 Series 200 and Series 300, and the HP Vectra PC. This option also enables the analyzer to control a printer or plotter. Option 021 includes a connector for an external keyboard, an HP-IB connector, and the *HP 8590 Series Spectrum Analyzer Programming Manual*.

Option 021 is also available as a kit (HP part number 5062-6454).